=> fil reg FILE 'REGISTRY' ENTERED AT 15:59:14 ON 10 AUG 2007 USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT. PLEASE SEE "HELP USAGETERMS" FOR DETAILS. COPYRIGHT (C) 2007 American Chemical Society (ACS)

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STRUCTURE FILE UPDATES: 9 AUG 2007 HIGHEST RN 944380-35-2 DICTIONARY FILE UPDATES: 9 AUG 2007 HIGHEST RN 944380-35-2

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TSCA INFORMATION NOW CURRENT THROUGH December 2, 2006

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REGISTRY includes numerically searchable data for experimental and predicted properties as well as tags indicating availability of experimental property data in the original document. For information on property searching in REGISTRY, refer to:

http://www.cas.org/support/stngen/stndoc/properties.html

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(FILE 'HOME' ENTERED AT 13:46:12 ON 10 AUG 2007)

FILE 'HCAPLUS' ENTERED AT 13:46:46 ON 10 AUG 2007
L1 1 SEA ABB=ON PLU=ON US2002102466/PN
SEL RN

FILE 'REGISTRY' ENTERED AT 13:47:37 ON 10 AUG 2007 L2 47 SEA ABB=ON PLU=ON (105-37-3/BI OR 105-58-8/BI OR 107-31-3/BI OR 108-32-7/BI OR 109-60-4/BI OR 109-99-9/BI OR 110-71-4/BI OR 110-82-7/BI OR 110-86-1/BI OR 111-96-6/ BI OR 123-91-1/BI OR 126-33-0/BI OR 141-78-6/BI OR 14283-07-9/BI OR 16508-95-5/BI OR 21324-40-3/BI OR 25496-08-6/BI OR 29935-35-1/BI OR 33454-82-9/BI OR 3741-38-6/BI OR 420-12-2/BI OR 462-06-6/BI OR 554-12-1/BI OR 60-29-7/BI OR 616-38-6/BI OR 623-53-0/BI OR 64-17-5/B I OR 646-06-0/BI OR 67-56-1/BI OR 67-63-0/BI OR 67-68-5/B I OR 68-12-2/BI OR 680-31-9/BI OR 71-43-2/BI OR 74432-42-1/BI OR 75-05-8/BI OR 7704-34-9/BI OR 7791-03-9/BI OR 78-93-3/BI OR 79-20-9/BI OR 822-38-8/BI OR 872-36-6/BI OR 90076-65-6/BI OR 930-35-8/BI OR 96-47-9/BI OR 96-48-0/BI OR 96-49-1/BI) D SCA

L3 1 SEA ABB=ON PLU=ON "LITHIUM SULFIDE"/CN
L4 1 SEA ABB=ON PLU=ON "ETHYLENE SULFITE"/CN
L5 1 SEA ABB=ON PLU=ON L2 AND L4

FILE 'LREGISTRY' ENTERED AT 14:24:09 ON 10 AUG 2007 L6 22102 SEA ABB=ON PLU=ON (C(L)H(L)S)/ELS

FILE 'REGISTRY' ENTERED AT 14:25:10 ON 10 AUG 2007

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                                   (C(L)H(L)S)/ELS AND 3/ELC.SUB
L7
                            PLU=ON
rs
              3 SEA ABB=ON
                            PLU=ON
                                   L2 AND L7
L9
         443638 SEA ABB=ON
                            PLU=ON
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L10
              3 SEA ABB=ON
                            PLU=ON
                                   L2 AND L9
                D SCA
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                           PLU=ON
                                   L8 OR L10
L11
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                            PLU=ON
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L12
                D SCA
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                           PLU=ON
                                   PYRIDINE/CN
                                    "METHYL FORMATE"/CN
L14
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                            PLU=ON
L15
              1 SEA ABB=ON
                            PLU=ON
                                   "N-PROPYL ACETATE"/CN
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L16
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L17
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L18
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L19
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L20
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                           PLU=ON BENZENE/CN
L21
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                           PLU=ON
                                   FLUOROBENZENE/CN
L22
              1 SEA ABB=ON
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L23
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                                    CYCLOHEXANE/CN
L24
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                            PLU=ON
                                    (L12 OR L13 OR L14 OR L15 OR L16 OR
                L17 OR L18 OR L19 OR L20 OR L21 OR L22 OR L23)
L25
              1 SEA ABB=ON
                           PLU=ON METHANOL/CN
L26
              1 SEA ABB=ON
                           PLU=ON
                                    HEXAMETHYLPHOSPHORAMIDE/CN
              1 SEA ABB=ON
L27
                           PLU=ON ETHANOL/CN
L28
              1 SEA ABB=ON
                           PLU=ON
                                   ISOPROPANOL/CN
L29
              4 SEA ABB=ON
                                   (L25 OR L26 OR L27 OR L28)
                           PLU=ON
L30
              1 SEA ABB=ON
                                   "ETHYLENE CARBONATE"/CN
                            PLU=ON
                            PLU=ON
                                   "PROPYLENE CARBONATE"/CN
L31
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L32
              1 SEA ABB=ON
                            PLU=ON
                                   "DIMETHYL SULFOXIDE"/CN
L33
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                            PLU=ON
                                   SULFOLANE/CN
              1 SEA ABB=ON
                                   96-48-0/RN
L34
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              1 SEA ABB=ON
L35
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                                   ACETONITRILE/CN
L36
              1 SEA ABB=ON
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                                   L2 AND FORMAMIDE
     FILE 'HCAPLUS' ENTERED AT 15:34:46 ON 10 AUG 2007
L37
                QUE ABB=ON
                            PLU=ON
                                   BATTER?
L38
            551 SEA ABB=ON
                           PLU=ON L7(L)L37
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         443638 SEA ABB=ON PLU=ON L9 OR L9
L39
                D RN 220000
L40
         223639 SEA RAN=(,136164-44-8) ABB=ON PLU=ON L9 OR L9
L41
         219999 SEA ABB=ON PLU=ON L39 NOT L40
     FILE 'HCAPLUS' ENTERED AT 15:38:15 ON 10 AUG 2007
L42
           1381 SEA ABB=ON
                           PLU=ON L40(L)L37
L43
                                   L41(L)L37
            184 SEA ABB=ON
                           PLU=ON
                QUE ABB=ON
L44
                           PLU=ON
                                   (LI OR LITHIUM? OR LI(A)S)(2A)BATTER?
                           PLU=ON
                                   (L38 OR L42 OR L43) AND L44
L45
           1206 SEA ABB=ON
L46
         290648 SEA ABB=ON
                           PLU=ON
                                   L24
            325 SEA ABB=ON
                           PLU=ON L45 AND L46
L47
                                   (SECOND? OR 2ND OR 2(W)ND)(A)SOLVENT?
L48
                QUE ABB=ON
                           PLU=ON
              7 SEA ABB=ON
                           PLU=ON
L49
                                   L47 AND L48
L50
                QUE ABB=ON PLU=ON
                                   ELECTROLY?
L51
           2492 SEA ABB=ON PLU=ON L24(L)L50
L52
            244 SEA ABB=ON PLU=ON
                                   L47 AND L51
                QUE ABB=ON
                           PLU=ON
                                    SOLVENT?
L53
L54
            174 SEA ABB=ON PLU=ON L52 AND L53
                QUE ABB=ON PLU=ON
                                   (LI(A)S OR LITHIUM(A)SULFUR)(2A)BATTE
L55
                R?
```

L56	7 SE <i>I</i>	A ABB=ON PLU=ON	L54 AND L55
L57	0 SEA	A ABB=ON PLU=ON	L49 AND L55
L58	7 SEA	A ABB=ON PLU=ON	L49 AND L51
L59	2563 SEA	A ABB=ON PLU=ON	(L25 OR L26 OR L27 OR L28)(L)L50
L60	8490 SEA	A ABB=ON PLU=ON	((L30 OR L31 OR L32 OR L33 OR L34 OR
•	L35	OR L36))(L)L50	
L61	4 SEA	A ABB=ON PLU=ON	(L56 OR L58) AND L59
L62	14 SEA	A ABB=ON PLU=ON	(L56 OR L58) AND L60

=> fil hcap

FILE 'HCAPLUS' ENTERED AT 15:59:17 ON 10 AUG 2007 USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT. PLEASE SEE "HELP USAGETERMS" FOR DETAILS.

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FILE COVERS 1907 - 10 Aug 2007 VOL 147 ISS 8 FILE LAST UPDATED: 9 Aug 2007 (20070809/ED)

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This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d 156 ibib abs hitstr hitind 1-7

L56 ANSWER 1 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2006:544098 HCAPLUS Full-text

DOCUMENT NUMBER: 145:30918

TITLE: Electrolyte for lithium-sulfur

batteries

INVENTOR(S): Kolosnitsyn, Vladimir; Karaseva, Elena

PATENT ASSIGNEE(S): Oxis Energy Ltd., UK SOURCE: PCT Int. Appl., 24 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent LANGUAGE: English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006059085	A1	20060608	WO 2005-GB4572	200511

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,

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GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM,
             KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG,
             MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT,
             RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT,
             TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW
         RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU,
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             BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD,
             TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
             ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
                                20060607
                          Α
                                            GB 2005-4290
     GB 2420907
                                                                    200503
                                                                    02
     GB 2420907
                          В
                                20060913
                                            EP 2005-818427
     EP 1815546
                          A1
                                20070808
                                                                    200511
                                                                    29
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             IE, IS, IT, LI, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK,
             TR
                                            RU 2004-135236
PRIORITY APPLN. INFO.:
                                                                 Α
                                                                    200412
                                                                    02
                                            GB 2005-4290
                                                                 Α
                                                                    200503
                                                                    02
                                            US 2005-657436P
                                                                    200503
                                                                    02
                                            WO 2005-GB4572
                                                                    200511
                                                                    29
     An electrolyte for a lithium-sulfur battery, the electrolyte comprising a solution
AB
     of at least one electrolyte salt in at least two aprotic solvents. The components
     of the solution are selected so that the solution is eutectic or close to
     eutectic. Also disclosed is a lithium- sulfur battery including such an
     electrolyte. By using a eutectic mixture, the performance of the electrolyte and
     the battery at low temps. is much improved.
     109-60-4, Propyl acetate 126-33-0, Sulfolane
IT
     623-53-0, Ethyl methyl carbonate 917-73-7
     1003-78-7, 2,4-Dimethylsulfolane 1977-37-3,
     Methylpropylsulfone 7560-59-0, Methylbutylsulfone
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        batteries)
RN
     109-60-4 HCAPLUS
CN
     Acetic acid, propyl ester (CA INDEX NAME)
```

n-Pr-- O-- Ac

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

0 MeO— 0— 0Et

RN 917-73-7 HCAPLUS

CN Methanethial, S,S-dioxide (9CI) (CA INDEX NAME)

СH₂ 0—— S—— о

RN 1003-78-7 HCAPLUS

CN Thiophene, tetrahydro-2,4-dimethyl-, 1,1-dioxide (CA INDEX NAME)

RN 1977-37-3 HCAPLUS

CN Propane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

RN 7560-59-0 HCAPLUS

CN Butane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

```
ST
     electrolyte lithium sulfur battery
IT
     Battery electrolytes
        (electrolyte for lithium-sulfur
        batteries)
IT
     Sulfones
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        batteries)
     Amines, uses
IT
     RL: MOA (Modifier or additive use); USES (Uses)
        (electrolyte for lithium-sulfur
        batteries)
IT
     Secondary batteries
        (lithium; electrolyte for lithium-
        sulfur batteries)
IT
     Lithium alloy, base
     RL: TEM (Technical or engineered material use); USES (Uses)
        (electrolyte for lithium-sulfur
        batteries)
IT
     79-20-9, Methyl acetate
                              96-47-9, 2-Methyltetrahydrofuran
     96-48-0, \gamma-Butyrolactone 96-49-1, Ethylene carbonate
     105-37-3, Ethyl propionate 105-58-8, Diethyl carbonate
                                                                108-32-7,
     Propylene carbonate 109-60-4, Propyl acetate
                                                    109-99-9,
     Thf, uses
                 110-71-4 111-96-6, Diglyme 126-33-0,
                 141-78-6, Ethyl acetate, uses 143-24-8, Tetraglyme
     Sulfolane
     554-12-1, Methyl propionate 616-38-6, Dimethyl carbonate
     623-53-0, Ethyl methyl carbonate 646-06-0, 1,3-Dioxolane
     917-73-7 1003-78-7, 2,4-Dimethylsulfolane
     1977-37-3, Methylpropylsulfone 7439-93-2, Lithium, uses
     7560-59-0, Methylbutylsulfone 7791-03-9, Lithium
     perchlorate
                  12136-58-2, Lithium sulfide 21324-40-3, Lithium
     hexafluorophosphate 29935-35-1, Lithium hexafluoroarsenate
     56525-42-9, Methyl propyl carbonate, uses
                                                 90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        batteries)
     7446-09-5, Sulfur dioxide, uses 7553-56-2, Iodine, uses
IT
     7704-34-9, Sulfur, uses 7726-95-6, Bromine, uses
                                                          7782-50-5,
                    10024-97-2, Nitrous oxide, uses 74432-42-1,
     Chlorine, uses
     Lithium polysulfide
     RL: MOA (Modifier or additive use); USES (Uses)
        (electrolyte for lithium-sulfur
        batteries)
REFERENCE COUNT:
                         17
                               THERE ARE 17 CITED REFERENCES AVAILABLE
                               FOR THIS RECORD. ALL CITATIONS AVAILABLE
                               IN THE RE FORMAT
L56 ANSWER 2 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
                         2006:529227 HCAPLUS Full-text
ACCESSION NUMBER:
DOCUMENT NUMBER:
                         145:11315
TITLE:
                         Electrolyte for lithium-sulfur
                         batteries and lithium
                         sulfur batteries using the
                         same
                         Kolosnitsyn, Vladimir; Karaseva, Elena
INVENTOR(S):
                         Oxis Energy Limited, UK; Intellikraft Limited
PATENT ASSIGNEE(S):
SOURCE:
                         Brit. UK Pat. Appl., 23 pp.
                         CODEN: BAXXDU
```

52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

CC

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: PATENT INFORMATION:

PATENT NO. KIND DATE APPLICATION NO. DATE GB 2420907 A 20060607 GB 2005-4290 200503 02 GB 2420907 20060913 В WO 2006059085 Α1 20060608 WO 2005-GB4572 200511 AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM 20070808 EP 2005-818427 EP 1815546 A1 200511 29 R: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LI, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, A1 20060608 US 2005-290825 US 2006121355 200512 01 PRIORITY APPLN. INFO.: RU 2004-135236 A 200412 02 GB 2005-4290 Α 200503 02 US 2005-657436P

WO 2005-GB4572

200503

200511

02

29

AB An electrolyte for a lithium-sulfur battery comprises a solution of ≥1 electrolyte salt in ≥2 aprotic solvents. The components of the solution are selected so that the solution is eutectic or close to eutectic. Also disclosed is a lithium-sulfur battery including such an electrolyte. By using a eutectic mixture, the performance of the electrolyte and the battery at low temps. is much improved.

IT 109-60-4, Propylacetate 126-33-0, Sulfolane
623-53-0, Ethylmethylcarbonate 1003-78-7,
2,4-Dimethylsulfolane 1977-37-3, Methylpropylsulfone

7560-59-0, Methylbutylsulfone 31124-38-6,

Ethylbutylsulfone

RL: NUU (Other use, unclassified); TEM (Technical or engineered

material use); USES (Uses)

(lithium sulfur battery

electrolytes)

RN 109-60-4 HCAPLUS

CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-0-Ac

RN 126-33-0 HCAPLUS

CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

RN 1003-78-7 HCAPLUS

CN Thiophene, tetrahydro-2,4-dimethyl-, 1,1-dioxide (CA INDEX NAME)

RN 1977-37-3 HCAPLUS

CN Propane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

RN 7560-59-0 HCAPLUS

CN Butane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

```
Me-|S-Bu-n
```

RN 31124-38-6 HCAPLUS CN Butane, 1-(ethylsulfonyl)- (9CI) (CA INDEX NAME)

Et-S-Bu-n

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 49 STlithium sulfur battery electrolyte IT Battery electrolytes Eutectics (lithium sulfur battery electrolytes) ITAmines, uses Carbon black, uses Polyoxyalkylenes, uses Sulfones RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses) (lithium sulfur battery electrolytes) IT Lithium alloy, base RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses) (lithium sulfur battery electrolytes) IT79-20-9, Methylacetate 96-47-9, 2-Methyltetrahydrofuran γ-Butyrolactone 96-49-1, Ethylene carbonate 105-37-3, Ethylpropionate 105-58-8, Diethylcarbonate 108-32-7, Propylene carbonate 109-60-4, Propylacetate 109-99-9, THF, uses 111-96-6, Diglyme 124-38-9, Carbon dioxide, uses 110-71-4 **126-33-0**, Sulfolane 141-78-6, Ethylacetate, uses 143-24-8, Tetraglyme 554-12-1, Methylpropionate 616-38-6, Dimethylcarbonate 623-53-0, Ethylmethylcarbonate 646-06-0, 1,3-Dioxolane 1003-78-7, 2,4-Dimethylsulfolane 1977-37-3, Methylpropylsulfone 7439-93-2D, Lithium, 7446-09-5, Sulfur dioxide, uses 7560-59-0, Methylbutylsulfone 7704-34-9D, Sulfur, derivs./polymers 7782-50-5, Chlorine, uses 7791-03-9, Lithium perchlorate 10024-97-2, Dinitrogen oxide, uses 18496-25-8, Sulfide 20461-54-5, Iodide, uses 21324-40-3, Lithium hexafluorophosphate 25322-68-3, Polyethylene oxide 24959-67-9, Bromide, uses 29935-35-1, Lithium hexafluoroarsenate 31124-38-6, Ethylbutylsulfone 33454-82-9, Lithium trifluoromethane sulfonate 56525-42-9, Methylpropylcarbonate, uses 39448-96-9 74432-42-1,

Lithium sulfide (Li2(Sx)) 90076-65-6, Lithium

bis(trifluoromethanesulfonyl)imide

RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)

(lithium sulfur battery

electrolytes)

REFERENCE COUNT:

4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L56 ANSWER 3 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2004:402981 HCAPLUS Full-text

DOCUMENT NUMBER: 140:409628

Organic electrolytic solution for TITLE:

lithium battery

Kim, Ju-Yup; Ryu, Young-Gyoon; Cho, Myung-Dong INVENTOR(S):

Samsung SDI Co., Ltd., S. Korea PATENT ASSIGNEE(S):

Eur. Pat. Appl., 19 pp. SOURCE:

CODEN: EPXXDW

DOCUMENT TYPE: Patent LANGUAGE: English

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

	PA	CENT	NO.			KIN) -	DATE		APP	LICAT	ION I	NO.		D.	ATE
	EP	1420	- 474			A1		2004	0519	EP 2	2003-	2540	63			00306 6
		R:									, IT, , AL,			-	SE,	MC,
	KR	2004		45		A		2004	0522	KR 2	2002-	7104	3		2	00211
	US	2004	0967	49		A1		2004	0520	US :	2003-	6019	07		2	00306 4
	CN	1501	540			A		2004	0602	CN :	2003-	1484	67		2	00306
	JP	2004	1721	17		A		2004	0617	JP :	2003-	3825	38			00311
PRIO	RIT	Y APP	LN.	INFO	.:					KR 2	2002-	7104	3	i	A	2 00211 5

OTHER SOURCE(S): MARPAT 140:409628

An organic electrolytic solution containing a lithium salt, an organic solvent, AΒ and an oxalate compound, and a lithium battery using the organic electrolytic solution are provided. Due to the oxalate compound, the organic electrolytic solution stabilizes lithium metal and improves the conductivity of lithium ions. Also,, the organic electrolytic solution present invention improves charging/discharging efficiency when used in lithium batteries having a lithium metal anode. Especially when the organic electrolytic solution is used in lithium sulfur batteries, the oxalate compound forms a chelate with lithium ions and improves the ionic conductivity and the charging/discharging efficiency of the battery. In addition, due to the chelation of the lithium ions, neg. sulfur ions remain free without interaction with lithium ions, are highly likely to dissolve

126-33-0, Sulfolane 623-53-0, Ethyl methyl IT carbonate RL: DEV (Device component use); USES (Uses) (organic electrolytic solution for lithium battery) RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME) RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME) ICM H01M010-40 IC ICS H01M006-16 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) CC STlithium battery org electrolyte soln Secondary batteries IT (lithium; organic electrolytic solution for lithium battery) ITBattery electrolytes (organic electrolytic solution for lithium battery) ΙT Lithium alloy, base RL: DEV (Device component use); USES (Uses) (organic electrolytic solution for lithium battery) IT 96-48-0, γ -Butyrolactone 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate 111-96-6, Diethylene glycol dimethyl ether 112-36-7, Diethylene glycol diethyl ether 112-49-2, Triethylene glycol dimethyl ether 126-33-0, Sulfolane 463-79-6D, Carbonic acid, ester 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 646-06-0, Dioxolane 872-36-6, Vinylene carbonate 1072-47-5, 1,3-Dioxolane, 4-methyl 1072-57-7, 1,3-Dioxolane, 4,5-dimethyl 4499-99-4, Triethylene glycol diethyl 7439-93-2, Lithium, uses 7704-34-9, Sulfur, uses 12137-46-1, Kasolite 29921-38-8, 1,3-Dioxolane, 4-ethyl 31371-55-8, Ethane, 1,2-dimethoxy-homopolymer 73506-93-1, 183140-14-9, 1,3-Dioxetan-2-one Diethoxyethane 676610-04-1, 1,3-Dioxolane, 4,5-diethyl RL: DEV (Device component use); USES (Uses) (organic electrolytic solution for lithium battery) IT95-92-1, Diethyl oxalate 338-70-5, uses 553-90-2, Dimethyl oxalate 615-98-5, Dipropyl oxalate 2050-60-4, Dibutyloxalate 7704-34-9D, Sulfur, organic compds. 18241-31-1, Bis (4methylbenzyl)oxalate 74432-42-1, Lithium polysulfide

in an electrolytic solution As a result, a reversible capacity of sulfur is

RL: MOA (Modifier or additive use); USES (Uses) (organic electrolytic solution for lithium battery)

L56 ANSWER 4 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2002:84081 HCAPLUS Full-text

DOCUMENT NUMBER:

136:137403

TITLE:

Electrolyte for a lithium-

sulfur battery

INVENTOR(S):

Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok;

APPLICATION NO.

DATE

Lee, Jeawoan; Jung, Yongju; Kim, Joosoak

PATENT ASSIGNEE(S):

Samsung SDI Co. Ltd., S. Korea

SOURCE:

Eur. Pat. Appl., 7 pp.

DATE

CODEN: EPXXDW

DOCUMENT TYPE:

Patent

LANGUAGE:

English

KIND

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.

					J 2
E F	 ? 1176659	A2	20020130	EP 2001-117661	200107
E		DE, DK,	ES, FR, C	GB, GR, IT, LI, LU, NL,	25 SE, MC,
KF	PT, IE, SI, R 2002008704			MK, CY, AL, TR KR 2000-42736	200007
KF	R 2002008705	Α	20020131	KR 2000-42737	25
1T.	2002075447	А	20020315	JP 2001-213435	200007 25
					200107 13
US	5 2002102466	A1	20020801	US 2001-910952	200107
CN	N 1335653	A	20020213	CN 2001-132526	200107
PRIORIT	ry APPLN. INFO.:			KR 2000-42736 A	25 200007 25
				KR 2000-42737 A	200007 25

- AB An electrolyte for a lithium-sulfur battery has a solvent having a dielec. constant that is greater than or equal to 20, a solvent having a viscosity that is less than or equal to 1.3, and an electrolyte salt. This battery shows excellent capacity and cycle life characteristics.
- IT 60-29-7, Ethyl ether, uses 67-68-5, Dmso, uses 71-43-2, Benzene, uses 78-93-3, Methylethyl ketone, uses 107-31-3, Methyl formate 109-60-4, n-Propyl acetate 110-82-7, Cyclohexane, uses 110-86-1, Pyridine, uses 123-91-1, p-Dioxane, uses 126-33-0, Sulfolane 420-12-2, Ethylene sulfide

462-06-6, Fluorobenzene 623-53-0, Ethylmethyl carbonate 822-38-8, Ethylene trithiocarbonate 930-35-8, Vinylene trithiocarbonate 3741-38-6, Ethylene sulfite 25496-08-6, Fluorotoluene RL: DEV (Device component use); USES (Uses) (electrolyte for lithium-sulfur battery)

RN 60-29-7 HCAPLUS

CN Ethane, 1,1'-oxybis- (CA INDEX NAME)

H3C-CH2-O-CH2-CH3

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

о || нзс— S— Снз

RN 71-43-2 HCAPLUS

CN Benzene (CA INDEX NAME)



RN 78-93-3 HCAPLUS

CN 2-Butanone (CA INDEX NAME)

RN 107-31-3 HCAPLUS

CN Formic acid, methyl ester (CA INDEX NAME)

O===CH-O-CH3

RN 109-60-4 HCAPLUS

CN Acetic acid, propyl ester (CA INDEX NAME)

RN 110-82-7 HCAPLUS CN Cyclohexane (CA INDEX NAME)

RN 110-86-1 HCAPLUS CN Pyridine (CA INDEX NAME)

RN 123-91-1 HCAPLUS CN 1,4-Dioxane (CA INDEX NAME)

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 420-12-2 HCAPLUS CN Thiirane (CA INDEX NAME)

s ك

RN 462-06-6 HCAPLUS CN Benzene, fluoro- (CA INDEX NAME)

 \bigcap^{F}

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

MeO-C-OEt

RN 822-38-8 HCAPLUS CN 1,3-Dithiolane-2-thione (CA INDEX NAME)

S S

RN 930-35-8 HCAPLUS CN 1,3-Dithiole-2-thione (CA INDEX NAME)

S S

RN 3741-38-6 HCAPLUS
CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

RN 25496-08-6 HCAPLUS
CN Benzene, fluoromethyl- (CA INDEX NAME)

D1— F

D1—Me

IC ICM H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST electrolyte lithium sulfur battery

IT Battery electrolytes (electrolyte for lithium-sulfur

IT Secondary batteries

battery)

(lithium; electrolyte for lithium-

```
sulfur battery)
IT
     60-29-7, Ethyl ether, uses 64-17-5, Ethanol, uses
     67-56-1, Methanol, uses 67-63-0, Isopropanol, uses 67-68-5
     , Dmso, uses
                    68-12-2, Dmf, uses 71-43-2, Benzene, uses
     75-05-8, Acetonitrile, uses 78-93-3, Methylethyl ketone,
           79-20-9, Methyl acetate 96-47-9, 2-Methyltetrahydrofuran
                               96-49-1, Ethylene carbonate
     96-48-0, y-Butyrolactone
     105-37-3, Ethyl propionate 105-58-8, Diethyl carbonate
     107-31-3, Methyl formate 108-32-7, Propylene carbonate
     109-60-4, n-Propyl acetate 109-99-9, Thf, uses
                                                        110-71-4.
     1,2-Dimethoxyethane 110-82-7, Cyclohexane, uses
     110-86-1, Pyridine, uses
                              111-96-6, Diglyme
     123-91-1, p-Dioxane, uses 126-33-0, Sulfolane
     141-78-6, Ethyl acetate, uses 420-12-2, Ethylene sulfide
                               554-12-1, Methyl propionate
     462-06-6, Fluorobenzene
     616-38-6, Dimethyl carbonate 623-53-0, Ethylmethyl
                 646-06-0, 1,3-Dioxolane 680-31-9,
     carbonate
     Hexamethylphosphoramide, uses 822-38-8, Ethylene
     trithiocarbonate
                        872-36-6, Vinylene carbonate 930-35-8,
     Vinylene trithiocarbonate 3741-38-6, Ethylene sulfite
                               7791-03-9, Lithium perchlorate
     7704-34-9, Sulfur, uses
     14283-07-9, Lithium tetrafluoroborate
                                            16508-95-5, Bismuth
     carbonate
                21324-40-3, Lithium hexafluorophosphate
     25496-08-6, Fluorotoluene 29935-35-1, Lithium
     hexafluoroarsenate
                         33454-82-9, Lithium triflate
                                                        74432-42-1,
     Lithium polysulfide
                          90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
       battery)
L56 ANSWER 5 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
                         2002:84080 HCAPLUS Full-text
DOCUMENT NUMBER:
                         136:137402
                         Electrolyte for a lithium-
```

ACCESSION NUMBER:

TITLE:

sulfur battery

INVENTOR(S):

Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok;

Lee, Jeawoan; Jung, Yongju; Kim, Joosoak

PATENT ASSIGNEE(S):

Samsung SDI Co. Ltd., S. Korea

SOURCE:

Eur. Pat. Appl., 11 pp. CODEN: EPXXDW

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1176658	A2	20020130	EP 2001-117642	
		. we e		200107
				24
EP 1176658	A3	20060531		
R: AT, BE, CH,	DE, DK	, ES, FR, GI	B, GR, IT, LI, LU, NL,	SE, MC,
PT, IE, SI,	LT, LV	, FI, RO, MI	K, CY, AL, TR	
KR 2002008703	A	20020131	KR 2000-42735	
	•			200007
				25
KR 2002014196	Α	20020225	KR 2000-47348	
				200008
				17

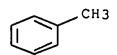
JP	2002083633	A	20020322	JP	2001-213414		
							200107 13
US	2002045101	Al	20020418	US	2001-911083		13
							200107 24
US	6852450	В2	20050208		t		44
CN	1335652	A	20020213	CN	2001-132525		000107
							200107 25
PRIORITY	APPLN. INFO.:			KR	2000-42735	Α	
							200007 25
				KR	2000-47348	Α	
	•						200008 17

AB An electrolyte for a lithium-sulfur battery includes a first component solvent with a sulfur solubility more than or equal to 20 mM, a second component solvent with a sulfur solubility less than 20 mM, a third component solvent with a high dielec. constant and a high viscosity, and an electrolyte salt. This battery shows excellent capacity and cycle life characteristics.

battery)
RN 71-43-2 HCAPLUS
CN Benzene (CA INDEX NAME)



RN 108-88-3 HCAPLUS CN Benzene, methyl- (CA INDEX NAME)



RN 109-60-4 HCAPLUS CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-O-Ac

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 462-06-6 HCAPLUS CN Benzene, fluoro- (CA INDEX NAME)

F

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

O II MeO—C—OEt

IC ICM H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST electrolyte lithium sulfur battery

IT Battery electrolytes

(electrolyte for lithium-sulfur battery)

IT Secondary batteries

(lithium; electrolyte for lithium-

sulfur battery)

IT Synthetic polymeric fibers, uses

RL: DEV (Device component use); USES (Uses)

(polysulfides, carbon-polysulfur polymer; electrolyte for lithium-sulfur battery)

IT Lithium alloy, base

RL: DEV (Device component use); USES (Uses)

(electrolyte for lithium-sulfur

battery)

IT 7440-44-0, Super P, uses

RL: MOA (Modifier or additive use); USES (Uses) (activated; electrolyte for lithium-sulfur

battery)

64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses 71-43-2 IT , Benzene, uses 79-20-9, Methyl acetate 2-Methyltetrahydrofuran 96-48-0, γ-Butyrolactone 105-37-3, Ethyl propionate 105-58-8, Diethyl Ethylene carbonate carbonate 108-32-7, Propylene carbonate 108-88-3, 108-94-1, Cyclohexanone, uses 109-60-4, Toluene, uses Propyl acetate 109-99-9, Thf, uses 110-71-4 110-82-7, 111-96-6, Diglyme 126-33-0, Sulfolane Cyclohexane, uses 141-78-6, Ethyl acetate, uses 143-24-8, Tetraglyme 554-12-1, Methyl propionate 462-06-6, Fluorobenzene 616-38-6, Dimethyl carbonate 623-53-0, Ethylmethyl carbonate 646-06-0, 1,3-Dioxolane 1330-20-7, Xylene, uses 7439-93-2, Lithium, uses 7704-34-9, Sulfur, uses 7704-34-9D. Sulfur, organic compound 7791-03-9, Lithium perchlorate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 27359-10-0, Trifluorotoluene 29935-35-1, Lithium 33454-82-9, Lithium triflate 56525-42-9, hexafluoroarsenate Methylpropyl carbonate, uses 74432-42-1, Lithium polysulfide 90076-65-6 RL: DEV (Device component use); USES (Uses) (electrolyte for lithium-sulfur battery) 124-38-9, Carbon dioxide, uses 7446-09-5, Sulfur dioxide, uses ΙT

IT 124-38-9, Carbon dioxide, uses 7446-09-5, Sulfur dioxide, uses 9003-20-7, Polyvinyl acetate 10024-97-2, Nitrous oxide, uses RL: MOA (Modifier or additive use); USES (Uses) (electrolyte for lithium-sulfur battery)

L56 ANSWER 6 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2000:141485 HCAPLUS Full-text

DOCUMENT NUMBER:

132:168757

TITLE:

Liquid electrolyte lithium-

sulfur batteries

INVENTOR(S):

Chu, May-Ying; De Jonghe, Lutgard C.; Visco,

Steven J.; Katz, Bruce D.

PATENT ASSIGNEE(S):

Polyplus Battery Co., Inc., USA

SOURCE:

U.S., 28 pp., Cont.-in-part of U.S. 5,686,201 CODEN: USXXAM

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT:

Englis

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 6030720	А	20000229	US 1997-948969	199710
US 5523179	А	19960604	US 1994-344384	10 199411
US 5582623	А	19961210	US 1995-479687	23 199506
US 5686201	Ą	19971111	US 1996-686609	07 199607
CA 2305454	A1	19990422	CA 1998-2305454	26 199810

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W	VO	9919)3I			ΑI		1999	0422	ì	WO	1998-	0521	707			199810
		W:	DE, KE, MN,	DK, KG, MW,	EE, KP, MX,	ES, KR, NO,	FI, KZ, NZ,	GB, LC, PL,	GE, LK, PT,	GH, LR, RO,	GM LS RU	, HR, , LT, , SD,	HU, LU, SE,	ID, LV,	IL, MD,	IS MC	06 J, CZ, S, JP, S, MK, K, SL,
P	U <i>F</i>		GH, ES, CG,	GM, FI, CI,	KE, FR, CM,	LS, GB, GA,	MW, GR, GN,	SD, IE, GW,	SZ, IT, ML,	UG, LU, MR,	ZW MC NE		BE, PT, TD,	SE, TG	-		E, DK, J, CF,
																	199810 06
		74183 10218				B2 A1		2001 2000		1	EP	1998-	95090	67			199810
E	ΞP	10218	349			В1		2003	0122								06
			PT,	IE,	SI,	LT,	LV,	FI,	RO						NL,	SE	E, MC,
E	3R	9812	749			A		2000	0829]	BR	1998-	12749	9			199810 06
J	JP	2001	5204	47		T	٠	2001	1030	•	JP	2000-	51639	92			199810 06
P	TA	23165	53			Т		2003	0215	Ž	ΑT	1998-	9509	67			199810
U	JS	6358	643			В1		2002	0319	1	US	2000-	49563	39			200002
PRIORI	ΙΤΥ	APP]	LN.	INFO	.:					1	US	1994-	34438	3 4		A2	01 199411 23
										1	us	1995-	47968	37		A2	199506 07
										1	US	1996-	68660	09		A2	199607 26
·										1	US	1997-	94890	69		A	199710 10
										Ţ	WO	1998-	US21	067		W	199810 06

OTHER SOURCE(S): MARPAT 132:168757

Disclosed are electrolyte solvents for ambient-temperature lithium-sulfur batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula R1(CH2CH2O)nR2, where n ranges between 2 and 10 and R1 and R2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R1 and R2 may together with

(CH2CH2O)n form a closed ring. Examples of linear solvents include the glymes (CH30(CH2 CH2)nCH3). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, N, N-diethylacetamide, N, Ndiethylformamide, dimethylsulfoxide, tetramethylurea, N,N-dimethylacetamide, N,Ndimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions. Examples of acceptor solvents include alcs., glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions. IT 67-68-5, Dimethylsulfoxide, uses 110-86-1, Pyridine, uses RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses) (liquid electrolyte lithium-sulfur batteries) RN 67-68-5 HCAPLUS CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME) RN 110-86-1 HCAPLUS CN Pyridine (CA INDEX NAME) IC ICM H01M010-40 INCL 429105000 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) STbattery lithium sulfur liq electrolyte ΙT Battery electrolytes Conducting polymers (liquid electrolyte lithium-sulfur batteries) Carbon black, uses ITPolyoxyalkylenes, uses RL: DEV (Device component use); MOA (Modifier or additive use); USES (liquid electrolyte lithium-sulfur batteries) ITAlcohols, uses RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses) (liquid electrolyte lithium-sulfur

RL: DEV (Device component use); TEM (Technical or engineered

batteries)

batteries)

material use); USES (Uses)

(liquid electrolyte lithium-sulfur

Crown ethers

```
RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
IT
    Glycols, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
IT
     Secondary batteries
        (lithium; liquid electrolyte lithium-
        sulfur batteries)
     Intercalation compounds
IT
     RL: DEV (Device component use); USES (Uses)
        (lithium; liquid electrolyte lithium-sulfur
       batteries)
     7439-93-2, Lithium, uses 7439-93-2D, Lithium, intercalation
IT
                      7440-23-5, Sodium, uses
                                              7704-34-9, Sulfur, uses
     compound, uses
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
IT
     25322-68-3, Polyethylene oxide
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
     (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
IT
     67-56-1, Methanol, uses 67-68-5, Dimethylsulfoxide, uses
     68-12-2, N, N-Dimethylformamide, uses 75-52-5, Nitromethane, uses
     76-05-1, Trifluoroacetic acid, uses
                                           107-21-1, Ethylene glycol,
     uses
            110-60-1, Tetramethylenediamine 110-86-1, Pyridine,
            110-95-2, Tetramethylpropylenediamine
                                                   126-73-8,
     uses
     Tributylphosphate, uses 127-19-5, N,N-Dimethylacetamide
     143-24-8, Tetraglyme
                            294-93-9, 12-Crown-4
                                                   512-56-1,
     Trimethylphosphate 617-84-5, N, N-Diethylformamide
                                                           632-22-4,
     Tetramethylurea 680-31-9, Hexamethylphosphoramide, uses
     685-91-6, N,N-Diethylacetamide 1493-13-6, Trifluoromethanesulfonic
            2832-49-7, N, N, N', N'-Tetraethylsulfamide
                                                       3030-47-5,
                                   7446-09-5, Sulfur dioxide, uses
     Pentamethyldiethylenetriamine
     7637-07-2, Boron trifluoride, uses
                                        14187-32-7, Dibenzo 18-crown-6
     17455-13-9, 18-Crown-6 33100-27-5, 15-Crown-5
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
     7440-44-0, Carbon, uses
IT
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
                         24
REFERENCE COUNT:
                               THERE ARE 24 CITED REFERENCES AVAILABLE
                               FOR THIS RECORD. ALL CITATIONS AVAILABLE
                               IN THE RE FORMAT
     ANSWER 7 OF 7
                    HCAPLUS
                             COPYRIGHT 2007 ACS on STN
L56
                         1999:271600 HCAPLUS Full-text
ACCESSION NUMBER:
DOCUMENT NUMBER:
                         130:284490
                         Liquid electrolyte lithium-
TITLE:
                         sulfur batteries
```

Chu, May-Ying; De Jonghe, Lutgard C.; Visco,

IT

Cryptands

INVENTOR(S):

Steven J.; Katz, Bruce D.

Polyplus Battery Company, Inc., USA PATENT ASSIGNEE(S):

PCT Int. Appl., 57 pp. SOURCE:

CODEN: PIXXD2

DOCUMENT TYPE:

LANGUAGE:

Patent English

15

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PA'	TENT	NO.			KIN	D .	DATE			APP	LICAT	TION	NO.		!	DATE
WO	9919	- 931			A1		1999	0422		WO	1998-	-US21	067			199810 06
	W:	DE, KE, MN,	DK, KG, MW,	EE, KP, MX,	ES, KR, NO,	FI, KZ, NZ,	GB, LC, PL,	GE, LK, PT,	GH, LR, RO,	GM LS RU	BY, HR, LT, SD,	HU, LU, SE,	ID, LV,	IL, MD,	CU IS MG	, CZ, , JP, , MK,
ne.	RW:	GH, ES, CG,	GM, FI, CI,	KE, FR, CM,	LS, GB, GA,	MW, GR, GN,	SD, IE, GW,	SZ, IT, ML,	UG, LU, MR,	ZW MC NE	, AT, , NL, , SN,	BE, PT, TD,	SE, TG	-		•
03	0030	120	,		A		2000	0223		0.5	1991-	- 5409	09			199710 10
CA	2305	454			A1		1999	0422		CA	1998-	-2305	454			199810 06
AU	9896	876			A		1999	0503		AU	1998-	-9687	6			199810 06
	7418 1021						2001 2000			EP	1998-	-9509	67			199810 06
		AT, PT,	BE,	CH,	DE,	DK,	2003 ES, FI,	FR,	GB,	GR	, IT,	LI,	LU,	NL,		
	9812										1998-					199810 06
JP	2001	5204	47		Т		2001	1030		JP	2000-	-5163	92			199810 06
AT	2316	53			T		2003	0215		AT	1998-	-9509	67			199810 06
RIORIT	Y APP	LN.	INFO	.:						US	1997-	-9489	69		Α	199710 10
										US	1994-	-3443	84			199411 23
										US	1995-	-4796	87			199506 07

US 1996-686609 A2

199607 26

WO 1998-US21067 W

199810 06

OTHER SOURCE(S): MARPAT 130:284490

Disclosed are electrolyte solvents for ambient-temperature lithium-sulfur batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula R1(CH2CH2O)nR2, where n ranges between 2 and 10 and R1 and R2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R1 and R2 may together with (CH2CH2O)n form a closed ring. Examples of linear solvents include the glymes (CH3O(CH2CH2)nCH3). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, N,N-diethylacetamide, N,N-diethylformamide, dimethylsulfoxide, tetramethylurea, N,N-dimethylacetamide, N,N-dimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'-tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions. Examples of acceptor solvents include alcs., glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions.

IT 67-68-5, Dimethylsulfoxide, uses 110-86-1,

Pyridine, uses

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(liquid electrolyte lithium-sulfur

batteries)

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

RN 110-86-1 HCAPLUS

CN Pyridine (CA INDEX NAME)



IC ICM H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST electrolyte solvent lithium sulfur

battery

IT Battery cathodes
Battery electrolytes

Secondary batteries

(liquid electrolyte lithium-sulfur

batteries)

IT Alcohols, uses

```
Carbon black, uses
     Carbon fibers, uses
     Glycols, uses
     Polyoxyalkylenes, uses
     Polysulfides
     Sulfides, uses
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
ΙT
     Crown ethers
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
    Cryptands
ΙT
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
IT
     143-24-8, Tetraethyleneglycol dimethyl ether 7439-93-2, Lithium,
     uses 7439-93-2D, Lithium, intercalation compound, uses 7440-23-5,
                   7440-44-0, Carbon, uses 7704-34-9, Sulfur, uses
     Sodium, uses
     7791-03-9, Lithium perchlorate 14283-07-9, Lithium
    tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate
     25322-68-3, Peo 29935-35-1, Lithium hexafluoroarsenate
     33454-82-9, Lithium triflate 74432-42-1, Lithium polysulfide
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
     67-56-1, Methanol, uses 67-68-5, Dimethylsulfoxide, uses
IT
     68-12-2, N, N-Dimethylformamide, uses 75-52-5, Nitromethane, uses
                                          107-21-1, Ethylene glycol,
     76-05-1, Trifluoroacetic acid, uses
     uses
            110-60-1, Tetramethylenediamine 110-86-1, Pyridine,
            110-95-2, Tetramethylpropylenediamine
     uses
                                                  126-73-8,
     Tributylphosphate, uses 127-19-5, N, N-Dimethylacetamide
     512-56-1, Trimethylphosphate 617-84-5, N,N-Diethylformamide
     632-22-4, Tetramethylurea 680-31-9, Hexamethylphosphoramide, uses
     685-91-6, N, N-Diethylacetamide 1493-13-6, Trifluoromethanesulfonic
           1822-45-3, Tetramethylpropylenediamine
                                                     2832-49-7,
    N, N, N', N'-Tetraethylsulfamide
                                    3030-47-5,
     Pentamethyldiethylenetriamine.
                                     7446-09-5, Sulfur dioxide, uses
     7637-07-2, Boron trifluoride, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
     294-93-9, 12-Crown-4 14187-32-7, Dibenzo-18-crown-6 17455-13-9,
IT
     18-Crown-6 33100-27-5, 15-Crown-5
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
REFERENCE COUNT:
                        7
                               THERE ARE 7 CITED REFERENCES AVAILABLE FOR
                               THIS RECORD. ALL CITATIONS AVAILABLE IN
                               THE RE FORMAT
=> d 158 ibib abs hitstr hitind 1-7
```

L58 ANSWER 1 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2005:1129877 HCAPLUS Full-text DOCUMENT NUMBER: 143:408181

TITLE:

Secondary lithium batteries

with good cycle efficiency and durability

INVENTOR(S):

Imasaka, Koji; Fujioka, Yuichi; Hashimoto,

Tsutomu; Tajima, Hidehiko; Adachi, Kazuyuki;

Shibata, Hiroyuki; Kai, Masaaki

PATENT ASSIGNEE(S):

Mitsubishi Heavy Industries, Ltd., Japan; Kyushu

Electric Power Co., Ltd.

SOURCE:

Jpn. Kokai Tokkyo Koho, 12 pp.

CODEN: JKXXAF

DOCUMENT TYPE:

Patent

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005294028	A	20051020	JP 2004-107291	200403
PRIORITY APPLN. INFO.:			JP 2004-107291	200403

AΒ The batteries contain Li-containing mixed oxides as cathode active mass, Li-doped graphite as anode active mass, and nonaq. electrolytes, and show terminal potential of discharge against Li ≤0.5 V.

67-68-5, Dimethyl sulfoxide, uses 107-31-3, Methyl ITformate 126-33-0, Sulfolane 623-53-0, Ethyl methyl carbonate 872-93-5, 3-Methylsulfolane RL: DEV (Device component use); USES (Uses) (electrolyte solvent; secondary

lithium batteries with good cycle efficiency and durability)

67-68-5 HCAPLUS RN

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

107-31-3 HCAPLUS RN

CN Formic acid, methyl ester (CA INDEX NAME)

O === CH - O - CH3

RN 126-33-0 HCAPLUS

CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)



```
RN
     623-53-0 HCAPLUS
CN
     Carbonic acid, ethyl methyl ester (CA INDEX NAME)
RN
     872-93-5 HCAPLUS
     Thiophene, tetrahydro-3-methyl-, 1,1-dioxide (CA INDEX NAME)
CN
IC
     ICM H01M010-40
     ICS H01M004-02; H01M004-58
CC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST
     lithium battery mixed oxide manganese cathode;
     graphite lithium doped anode battery; nonag
     electrolyte ethylene dimethyl carbonate; ethyl methyl carbonate
     vinylene nonaq electrolyte
IT
     Secondary batteries
        (lithium; secondary lithium batteries
        with good cycle efficiency and durability)
IT
     Battery anodes
       Battery cathodes
       Battery electrolytes
        (secondary lithium batteries with good cycle
        efficiency and durability)
IT
     7782-42-5, Graphite, uses
     RL: DEV (Device component use); USES (Uses)
        (Li-doped anode; secondary lithium batteries
        with good cycle efficiency and durability)
IT
     12057-17-9, Lithium manganese oxide (LiMn2O4)
     RL: DEV (Device component use); USES (Uses)
        (cathode; secondary lithium batteries with
        good cycle efficiency and durability)
     7439-93-2, Lithium, uses
IT
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
     (Uses)
        (doped in graphite; secondary lithium batteries
        with good cycle efficiency and durability)
                                         7791-03-9, Lithium perchlorate
IT
     7447-41-8, Lithium chloride, uses
     10377-51-2, Lithium iodide 14024-11-4, Lithium
     tetrachloroaluminate 14283-07-9, Lithium tetrafluoroborate
     18424-17-4, Lithium hexafluoroantimonate 21324-40-3, Lithium
     hexafluorophosphate
                           29935-35-1, Lithium hexafluoroarsenate
     33454-82-9, Lithium trifluoromethanesulfonate
                                                     131651-65-5, Lithium
     nonafluorobutanesulfonate
     RL: DEV (Device component use); USES (Uses)
```

```
(electrolyte salt; secondary lithium batteries
       with good cycle efficiency and durability)
IT
     67-68-5, Dimethyl sulfoxide, uses
                                         68-12-2,
     N, N-Dimethylformamide, uses 75-05-8, Acetonitrile, uses
                                                                 79-20-9,
     Methyl acetate
                     96-47-9, 2-Methyltetrahydrofuran
                                                         96-48-0,
    γ-Butyrolactone 96-49-1, Ethylene carbonate
                                                    105-58-8,
     Diethyl carbonate 107-31-3, Methyl formate
                                                 108-29-2,
    γ-Valerolactone 108-32-7, Propylene carbonate
                                                      109-87-5,
     Dimethoxymethane 109-99-9, Tetrahydrofuran, uses
                                                          110-71-4,
                                               127-19-5,
     1,2-Dimethoxyethane 126-33-0, Sulfolane
     N, N-Dimethylacetamide
                             554-12-1, Methyl propionate
                                                           616-38-6,
     Dimethyl carbonate 623-53-0, Ethyl methyl carbonate
     646-06-0, 1,3-Dioxolane 872-93-5, 3-Methylsulfolane
     1072-47-5, 4-Methyl-1,3-dioxolane 4437-85-8, Butylene carbonate
     19836-78-3
     RL: DEV (Device component use); USES (Uses)
        (electrolyte solvent; secondary
        lithium batteries with good cycle efficiency
        and durability)
IT
     872-36-6, Vinylene carbonate
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
        (in nonaq. electrolyte; secondary lithium
       batteries with good cycle efficiency and durability)
L58 ANSWER 2 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
                         2004:118572 HCAPLUS Full-text
```

ACCESSION NUMBER:

DOCUMENT NUMBER:

140:149163

TITLE:

Secondary batteries with nonaqueous electrolytes Saito, Midori; Komaru, Atsuo; Satori, Kotaro;

Inagaki, Naoko; Tanizaki, Hiroaki

PATENT ASSIGNEE(S):

Sony Corp., Japan

SOURCE:

Jpn. Kokai Tokkyo Koho, 32 pp.

CODEN: JKXXAF

DOCUMENT TYPE:

INVENTOR(S):

Patent

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004047131	A	20040212	JP 2002-199068	200207
PRIORITY APPLN. INFO.:			JP 2002-199068	08
				200207 08

OTHER SOURCE(S):

MARPAT 140:149163

GI

The battery comprises (A) a cathode, (B) an anode containing metals, alloys, elements, or their compds. that can form compds. with Li, and (C1) a nonaq. electrolyte containing ≥1 solvent(s) selected from a 1st solvent group, i.e. ethylene carbonate, fluoroethylene carbonate, propylene carbonate, butylene carbonate, γ-Bu lactone, and ethylene sulfite and ≥1 solvent(s) selected from a 2nd solvent group, i.e. di-Me carbonate, Me Et carbonate, di-Et carbonate, Me Pr carbonate, di-Pr carbonate, diisopropyl carbonate, DMSO, and di-Et sulfoxide or (C2) a nonaq. electrolyte containing ≥1 oxathiolane-2,2-dioxides I and II (X = H, F, C1, Br, Me, CH2F, CHF2, CF3). The batteries have high energy d. and show excellent charge-discharge cycles.

IT 67-68-5, Dimethyl sulfoxide, uses 70-29-1, Diethyl sulfoxide 623-53-0, Methyl ethyl carbonate 1120-71-4 1633-83-6 3741-38-6, Ethylene sulfite 652143-75-4 652143-82-3

RL: DEV (Device component use); USES (Uses)
 (nonaq. electrolyte; secondary lithium
 batteries with nonaq. electrolytes with cyclic
 solvents and noncyclic solvents)

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

о || | нас— §— сна

RN 70-29-1 HCAPLUS CN Ethane, 1,1'-sulfinylbis- (CA INDEX NAME)

0 | | Et _ S _ Et

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

MeO-C-OEt

RN 1120-71-4 HCAPLUS CN 1,2-Oxathiolane, 2,2-dioxide (CA INDEX NAME)

RN 1633-83-6 HCAPLUS CN 1,2-Oxathiane, 2,2-dioxide (CA INDEX NAME)

RN 3741-38-6 HCAPLUS
CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

RN 652143-75-4 HCAPLUS CN 1,2-Oxathiolane, methyl-, 2,2-dioxide (9CI) (CA INDEX NAME)

D1—Me

RN 652143-82-3 HCAPLUS
CN 1,2-Oxathiane, methyl-, 2,2-dioxide (9CI) (CA INDEX NAME)

D1— Me

IC ICM H01M010-40 ICS H01M004-38

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 27

ST secondary lithium battery nonaq electrolyte; oxathiolanedioxide nonaq electrolyte secondary battery; carbonate electrolyte nonaq secondary battery; propionate lithium salt nonaq secondary battery

IT Secondary batteries

(lithium; secondary lithium batteries with nonaq. electrolytes with cyclic solvents and noncyclic solvents)

```
ΙT
     Battery electrolytes
        (nonaq.; secondary lithium batteries with
        nonag. electrolytes with cyclic solvents and noncyclic solvents)
                               7440-31-5, Tin, uses
     7440-21-3, Silicon, uses
                                                       259750-80-6
IT
     RL: DEV (Device component use); USES (Uses)
        (anode; secondary lithium batteries with
        nonaq. electrolytes with cyclic solvents and noncyclic solvents)
IT
     12190-79-3, Cobalt lithium oxide (CoLiO2)
     RL: DEV (Device component use); USES (Uses)
        (cathode; secondary lithium batteries with
        nonaq. electrolytes with cyclic solvents and noncyclic solvents)
     67-68-5, Dimethyl sulfoxide, uses 70-29-1, Diethyl
ΙT
     sulfoxide
                96-48-0
                          96-49-1, Ethylene carbonate
                                                        105-37-3, Ethyl
     propionate 105-58-8, Diethyl carbonate 108-32-7, Propylene
     carbonate
                 554-12-1, Methyl propionate
                                               616-38-6, Dimethyl
     carbonate 623-53-0, Methyl ethyl carbonate
                                                  623-96-1,
     Dipropyl carbonate 1120-71-4 1633-83-6
     3741-38-6, Ethylene sulfite 4437-85-8, Butylene carbonate
     6482-34-4, Diisopropyl carbonate
                                        14283-07-9, Lithium
     tetrafluoroborate
                       21324-40-3, Lithium hexafluorophosphate
     56525-42-9, Methyl propyl carbonate, uses
                                                 114435-02-8,
     Fluoroethylene carbonate
                                652143-72-1
                                              652143-73-2
                                                            652143-74-3
                   652143-76-5
                                 652143-77-6
                                               652143-78-7
     652143-75-4
                   652143-80-1
                                 652143-81-2 652143-82-3
     652143-79-8
                                 652143-85-6
     652143-83-4
                   652143-84-5
     RL: DEV (Device component use); USES (Uses)
        (nonaq. electrolyte; secondary lithium
       batteries with nonag. electrolytes with cyclic
        solvents and noncyclic solvents)
L58 ANSWER 3 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                         2003:488841 HCAPLUS Full-text
DOCUMENT NUMBER:
                         139:55432
TITLE:
                         Secondary nonaqueous battery with cathode
                         containing carbon sulfide polymer
                         Nakai, Toshihiro; Zhao, Jin-Bao; Uenae,
INVENTOR(S):
                         Keiichiro; Iizuka, Yoshiji; Nagai, Toru
                         Hitachi Maxell Ltd., Japan
PATENT ASSIGNEE(S):
```

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

Patent

DOCUMENT TYPE:

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003178750	А	20030627	JP 2001-377197	200112
PRIORITY APPLN. INFO.:			JP 2001-377197	200112
				11

OTHER SOURCE(S): MARPAT 139:55432

The claimed battery is equipped with a cathode containing a poly(carbon sulfide) active mass layer formed on a current collector and a C-type conductive layer formed on the active mass layer. Preferably, the battery comprises an electrolyte

```
solution containing a S-containing compound solvent and/or an ethylene oxide-type
     solvent. The battery provides high capacity and long cycle life.
IT
     60-29-7, Diethyl ether, uses 67-68-5, Dimethyl
     sulfoxide, uses 126-33-0, Sulfolan
     RL: DEV (Device component use); USES (Uses)
        (electrolyte solvent; secondary
        nonaq. battery with cathode containing carbon sulfide
        polymer)
     60-29-7 HCAPLUS
RN
     Ethane, 1,1'-oxybis- (CA INDEX NAME)
CN
 H3C-CH2-O-CH2-CH3
RN
     67-68-5 HCAPLUS
CN
    Methane, 1,1'-sulfinylbis- (CA INDEX NAME)
RN
     126-33-0 HCAPLUS
CN
     Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)
IC
     ICM H01M004-02
     ICS H01M004-58; H01M010-40
CC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT
     Secondary batteries
        (lithium; secondary nonaq. battery with
        cathode containing carbon sulfide polymer)
IT
     60-29-7, Diethyl ether, uses 67-68-5, Dimethyl
     sulfoxide, uses
                       96-47-9, 2-Methyl-tetrahydrofuran 109-99-9,
     Tetrahydrofuran, uses 126-33-0, Sulfolan 143-24-8,
     Tetraglyme
                646-06-0, Dioxolane
     RL: DEV (Device component use); USES (Uses)
        (electrolyte solvent; secondary
        nonaq. battery with cathode containing carbon sulfide
        polymer)
L58 ANSWER 4 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                         2003:433057 HCAPLUS Full-text
DOCUMENT NUMBER:
                         139:9306
TITLE:
                         Secondary nonaqueous-electrolyte battery
                         with lithium titanium oxide anode
                         Takahashi, Tadayoshi; Kawaguchi, Shinichi;
INVENTOR(S):
                         Koshiba, Tokiharu
                         Matsushita Electric Industrial Co., Ltd., Japan
PATENT ASSIGNEE(S):
SOURCE:
                         Jpn. Kokai Tokkyo Koho, 5 pp.
```

CODEN: JKXXAF

DOCUMENT TYPE:

Patent Japanese

LANGUAGE:

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003163029	A	20030606	JP 2001-360563	200111
				27
PRIORITY APPLN. INFO.:			JP 2001-360563	
			•	200111 27

The claimed battery is equipped with an anode containing spinel-structure Li Ti oxide Li4/3Ti5/3O4, a cathode showing Li ion-intercalation at ≥3 V (vsLi/Li+), and an electrolyte solution containing propane sultone and/or ethylene sulfite. The anode has high conductivity and the battery provides good high-load discharge characteristics.

IT 1120-71-4, Propane sultone 3741-38-6, Ethylene sulfite

RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(electrolyte additive; secondary nonaq.-electrolyte battery with lithium titanium oxide anode and sulfur compound additive)

RN 1120-71-4 HCAPLUS

CN 1,2-Oxathiolane, 2,2-dioxide (CA INDEX NAME)

RN 3741-38-6 HCAPLUS

CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

IT 623-53-0, Ethyl methyl carbonate

RL: DEV (Device component use); USES (Uses)

(electrolyte solvent; secondary nonaq.-electrolyte battery with

lithium titanium oxide anode and sulfur compound additive)

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

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0
||
|MeO__C_OEt
```

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IC
     ICM H01M010-40
     ICS H01M004-02; H01M004-58
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
CC
     lithium titanium oxide anode secondary battery; propane sultone
ST
     ethylene sulfite electrolyte lithium secondary
     battery
IT
     Secondary batteries
        (lithium; secondary nonaq.-electrolyte battery
        with lithium titanium oxide anode and sulfur compound
        additive)
IT
     Battery anodes
                                                     7
     Battery electrolytes
        (secondary nonaq.-electrolyte battery with
        lithium titanium oxide anode and sulfur compound additive)
IT
     12031-95-7, Lithium titanium oxide (Li4Ti5012)
     RL: DEV (Device component use); USES (Uses)
        (anode; secondary nonaq.-electrolyte battery with
        lithium titanium oxide anode and sulfur compound additive)
     12190-79-3, Cobalt lithium oxide (CoLiO2)
IT
     RL: DEV (Device component use); USES (Uses)
        (cathode; secondary nonag.-electrolyte battery with
        lithium titanium oxide anode and sulfur compound additive)
IT
     1120-71-4, Propane sultone 3741-38-6, Ethylene
     sulfite
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
     (Uses)
        (electrolyte additive; secondary nonaq.-electrolyte
        battery with lithium titanium oxide anode and
        sulfur compound additive)
IT
     96-49-1, Ethylene carbonate 623-53-0, Ethyl methyl
     carbonate
     RL: DEV (Device component use); USES (Uses)
        (electrolyte solvent; secondary
        nonaq.-electrolyte battery with
        lithium titanium oxide anode and sulfur compound additive)
L58 ANSWER 5 OF 7
                    HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                         2002:139093 HCAPLUS Full-text
DOCUMENT NUMBER:
                         136:203048
TITLE:
                         Nonaqueous electrolyte solutions containing
                         phenylsulfonic acids and batteries
                         Hinohara, Akio; Ishida, Tatsuyoshi; Hirano,
INVENTOR(S):
                         Chiho
PATENT ASSIGNEE(S):
                         Mitsui Chemicals Inc., Japan
SOURCE:
                         Jpn. Kokai Tokkyo Koho, 9 pp.
                         CODEN: JKXXAF
DOCUMENT TYPE:
                         Patent
LANGUAGE:
                         Japanese
FAMILY ACC. NUM. COUNT:
PATENT INFORMATION:
     PATENT NO.
                         KIND
                                            APPLICATION NO.
                                                                    DATE
                                DATE
                                20020222
     JP 2002056891
                        Α
                                            JP 2000-240850
```

200008

PRIORITY APPLN. INFO.:

JP 2000-240850

200008

OTHER SOURCE(S):

MARPAT 136:203048

GI

The electrolyte solns. contain phenylsulfonic acids I (R1 = H, metal; R2-6 = H, halogen, OH, sulfonic acid group, metal sulfonate, carboxylic acid group, metal carboxylate, C1-10 organic group). Preferably, the organic solvents contain cyclic esters II and/or linear carbonic acid esters III (R7-10 = H, C1-6 alkyl; X = O, CH2). Batteries comprising such electrolytes, e.g. secondary lithium batteries, are also claimed. Batteries with long cycle life are obtained.

IT 623-53-0, Methylethyl carbonate 30553-06-1,

Sulfobenzoic acid

RL: DEV (Device component use); USES (Uses)
 (organic solvents containing phenylsulfonic acids as
 electrolytes in batteries for long cycle
 lifetime)

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

Me O- C- OF t

RN 30553-06-1 HCAPLUS

CN Benzoic acid, sulfo- (CA INDEX NAME)



D1-CO2H

D1-SO3H

IC ICM H01M010-40

ICS H01M004-02; H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 25, 27 ST battery nonaq electrolyte phenylsulfonic acid; org solvent secondary lithium battery electrolyte; cyclic ester battery nonaq electrolyte; carbonate ester battery

nonaq electrolyte
IT Secondary batteries

(lithium; organic solvents containing phenylsulfonic acids as electrolytes in batteries for long cycle lifetime)

IT 96-49-1, Ethylene carbonate 623-53-0, Methylethyl carbonate 28877-24-9 30553-06-1, Sulfobenzoic acid 400846-62-0

RL: DEV (Device component use); USES (Uses)
(organic solvents containing phenylsulfonic acids as
electrolytes in batteries for long cycle
lifetime)

L58 ANSWER 6 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2002:27742 HCAPLUS Full-text

DOCUMENT NUMBER:

136:72342

TITLE:

Nonaqueous-electrolyte solution and secondary

battery using it

INVENTOR(S):

Hinohara, Akio

PATENT ASSIGNEE(S): SOURCE:

Mitsui Chemicals Inc., Japan Jpn. Kokai Tokkyo Koho, 10 pp.

CODEN: JKXXAF

DOCUMENT TYPE:

Patent

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002008718	Α	20020111	JP 2000-192566	
				200006 27
PRIORITY APPLN. INFO.:			JP 2000-192566	2 /
				200006
			•	27

OTHER SOURCE(S): MARPAT 136:72342

The solution consists of a nonaq. solvent containing an anhydride of sulfonic acid and carboxylic acid R1SO3C(0)R2 (R1 and R2 = C1-10 organic group; R1 may be bonded with R2). Optionally, the solution contains HF. A secondary battery containing the above electrolyte solution is also claimed. The battery has good high-temperature storage stability.

IT 81-08-3, o-Sulfobenzoic acid anhydride 623-53-0,

Methyl ethyl carbonate

RL: DEV (Device component use); USES (Uses)

(solvent; nonaq.-electrolyte solution containing sulfonic and carboxylic anhydride for secondary battery)

RN 81-08-3 HCAPLUS

CN 3H-2,1-Benzoxathiol-3-one, 1,1-dioxide (CA INDEX NAME)

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

O II MeO—C—OEt

IT

IC ICM H01M010-40

ICS H01M004-02; H01M004-58; H01M006-16

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST sulfonic carboxylic acid anhydride nonaq electrolyte solvent secondary battery

IT Secondary batteries

(lithium; nonaq.-electrolyte solution containing sulfonic and

carboxylic anhydride for secondary battery)

81-08-3, o-Sulfobenzoic acid anhydride 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene

carbonate 616-38-6, Dimethyl carbonate 623-53-0, Methyl

ethyl carbonate 872-36-6, Vinylene carbonate 4437-85-8, Butylene carbonate

RL: DEV (Device component use); USES (Uses)

(solvent; nonaq.-electrolyte solution containing sulfonic and carboxylic anhydride for secondary battery)

L58 ANSWER 7 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1987:480996 HCAPLUS Full-text

DOCUMENT NUMBER: 107:80996

TITLE: Nonaqueous electrochemical cell

INVENTOR(S): Whitney, Thomas A.; Foster, Donald L.

PATENT ASSIGNEE(S): Duracell, Inc., USA

SOURCE: U.S., 6 pp.

CODEN: USXXAM

DOCUMENT TYPE: Patent LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 4670363	A	19870602	US 1986-910694	198609 22
WO 8802188	A1	19880324	WO 1987-US2191	198708 31

W: AU, BR, DK, JP, KR

RW: AT, BE, CH, DE, FR, GB, IT, LU, NL, SE

AU 87803	75 A	19880407	AU 1987-80375	
				198708 31
EP 28257	6 A1	19880921	EP 1987-906615	198708
				31
R:	AT, BE, CH, DE, FI	R, GB, IT, LI,	LU, NL, SE	
JP 01501	026 T	19890406	JP 1987-506017	
				198708
				31
CA 12828	25 C	19910409	CA 1987-547554	
				198709
	·			22
DK 88028	23 A	19880707	DK 1988-2823	
				198805
				24
PRIORITY APPL	N INFO ·		US 1986-910694	A
111101111111111	1111011		05 1500 510051	198609
				22
	·			<i>L. L.</i>
			WO 1007-UC2101	A
			WO 1987-US2191	
				198708
				31

AB An improved electrolyte for an alkali or alkaline earth metal battery comprises an alkali-metal or alkaline earth salt complexed with a monomeric or polymeric polyfunctional chelating tertiary amine containing ≥2 N atoms, a 1st solvent selected from aprotic aromatic organic solvents and their mixts., and a 2nd solvent selected from aprotic organic solvents having a dielec. constant $\varepsilon \geq 20$ and their mixts. The 2nd solvent is present in an amount sufficient to increase the conductivity measured at 25° and 1 kHz to $\geq 10-3/\Omega$ -cm. The 1st solvent is selected from the group of C6H6, MePh, xylenes, pyridine, and N-methylpyrrole. The 2nd solvent is selected from the group of sulfolane, 3-methylsulfolane, and 3-methyl-2-oxazolidinone (I). The tertiary amine is selected from the group of pentamethyldiethylenetriamine (PMDT), tetramethylethylenediamine, tetramethylcyclohexanediamine, hexamethyltriethylenetetramine, and tris- $(\beta$ - dimethylaminoethyl)amine, and their mixture The resp. conductivities at 25° of 0.8 M LiI.PMDT in MePh, I, and 1:1 (volume) MePh-I were 1.3 + 10-5, 6.2 + 10-3, and 7.2 + 10-3/ Ω -cm. High cycle lives of Li batteries having the invention electrolyte are also reported. 108-88-3, Toluene, uses and miscellaneous 110-86-1 ΙT

, Pyridine, uses and miscellaneous 126-33-0, Sulfolane

RL: USES (Uses)

(electrolytes with solvent mixts. containing, conductivity of, for batteries)

RN 108-88-3 HCAPLUS

CN Benzene, methyl- (CA INDEX NAME)

RN 110-86-1 HCAPLUS

CN Pyridine (CA INDEX NAME)



RN 126-33-0 HCAPLUS

CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

ICM H01M006-14 IC

INCL 429196000

52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 76

lithium battery nonaq electrolyte; iodide ST lithium pentamethyldiethylenetriamine battery electrolyte; toluene methyloxazolidinone battery electrolyte; elec cond battery electrolyte

IT Batteries, secondary

> (lithium, with electrolyte containing lithium salt complexed with tertiary amines in organic solvent mixture)

96-54-8, N-Methylpyrrole 108-32-7, Propylene carbonate IT 108-88-3, Toluene, uses and miscellaneous 110-86-1 , Pyridine, uses and miscellaneous 126-33-0, Sulfolane 19836-78-3, 3-Methyl-2-oxazolidinone 646-06-0, Dioxolane RL: USES (Uses)

(electrolytes with solvent mixts. containing, conductivity of, for batteries)

=> d 161 ibib abs hitstr hitind 1-4

L61 ANSWER 1 OF 4 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:84081 HCAPLUS Full-text DOCUMENT NUMBER: 136:137403

TITLE: Electrolyte for a lithium-

sulfur battery

INVENTOR(S): Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok;

Lee, Jeawoan; Jung, Yongju; Kim, Joosoak

PATENT ASSIGNEE(S): Samsung SDI Co. Ltd., S. Korea

Patent

SOURCE: Eur. Pat. Appl., 7 pp.

CODEN: EPXXDW

LANGUAGE: English

FAMILY ACC. NUM. COUNT: PATENT INFORMATION:

DOCUMENT TYPE:

PATENT NO. KIND DATE APPLICATION NO. DATE EP 2001-117661 A2 20020130 EP 1176659

200107 25

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20060531
     EP 1176659
                           Α3
         R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC,
             PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR
                                 20020131
                                             KR 2000-42736
     KR 2002008704
                           Α
                                                                      200007
                                                                      25
                                 20020131
                                              KR 2000-42737
     KR 2002008705
                           Α
                                                                      200007
                                                                      25
                                 20020315
     JP 2002075447
                           Α
                                              JP 2001-213435
                                                                      200107
                                                                      13
                                 20020801
                                              US 2001-910952
     US 2002102466
                           A1
                                                                      200107
                                                                      24
                                              CN 2001-132526
     CN 1335653
                           Α
                                 20020213
                                                                      200107
                                                                      25
PRIORITY APPLN. INFO.:
                                              KR 2000-42736
                                                                      200007
                                                                      25
                                              KR 2000-42737
                                                                   Α
                                                                      200007
                                                                      25
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AB An electrolyte for a lithium-sulfur battery has a solvent having a dielec. constant that is greater than or equal to 20, a solvent having a viscosity that is less than or equal to 1.3, and an electrolyte salt. This battery shows excellent capacity and cycle life characteristics.

capacity and cycle life characteristics.

IT 60-29-7, Ethyl ether, uses 64-17-5, Ethanol, uses 67-56-1, Methanol, uses 67-63-0, Isopropanol, uses 67-68-5, Dmso, uses 71-43-2, Benzene, uses 78-93-3, Methylethyl ketone, uses 107-31-3, Methyl formate 109-60-4, n-Propyl acetate 110-82-7, Cyclohexane, uses 110-86-1, Pyridine, uses 123-91-1, p-Dioxane, uses 126-33-0, Sulfolane 420-12-2, Ethylene sulfide 462-06-6, Fluorobenzene 623-53-0, Ethylmethyl carbonate 680-31-9, Hexamethylphosphoramide, uses 822-38-8, Ethylene trithiocarbonate 930-35-8, Vinylene trithiocarbonate 3741-38-6, Ethylene sulfite 25496-08-6, Fluorotoluene

BL: DEV (Device component use): USES (Uses)

RL: DEV (Device component use); USES (Uses)
 (electrolyte for lithium-sulfur
 battery)

RN 60-29-7 HCAPLUS

CN Ethane, 1,1'-oxybis- (CA INDEX NAME)

H3C-CH2-O-CH2-CH3

RN 64-17-5 HCAPLUS CN Ethanol (CA INDEX NAME) RN 67-56-1 HCAPLUS

CN Methanol (CA INDEX NAME)

нзс—он

RN 67-63-0 HCAPLUS

CN 2-Propanol (CA INDEX NAME)

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

RN 71-43-2 HCAPLUS

CN Benzene (CA INDEX NAME)



RN 78-93-3 HCAPLUS

CN 2-Butanone (CA INDEX NAME)

RN 107-31-3 HCAPLUS

CN Formic acid, methyl ester (CA INDEX NAME)

O == CH - O - CH 3

RN 109-60-4 HCAPLUS

CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-0-Ac

RN 110-82-7 HCAPLUS

CN Cyclohexane (CA INDEX NAME)



RN 110-86-1 HCAPLUS

CN Pyridine (CA INDEX NAME)



RN 123-91-1 HCAPLUS

CN 1,4-Dioxane (CA INDEX NAME)



RN 126-33-0 HCAPLUS

CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)



RN 420-12-2 HCAPLUS

CN Thiirane (CA INDEX NAME)



RN 462-06-6 HCAPLUS

CN Benzene, fluoro- (CA INDEX NAME)

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

MeO—C—OEt

RN 680-31-9 HCAPLUS CN Phosphoric triamide, N,N,N',N',N'',N''-hexamethyl- (CA INDEX NAME)

Me₂N—P—NMe₂

RN 822-38-8 HCAPLUS CN 1,3-Dithiolane-2-thione (CA INDEX NAME)

S S

RN 930-35-8 HCAPLUS
CN 1,3-Dithiole-2-thione (CA INDEX NAME)

S S

RN 3741-38-6 HCAPLUS
CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

0,s=0

RN 25496-08-6 HCAPLUS CN Benzene, fluoromethyl- (CA INDEX NAME)



D1-F

D1-Me

DOCUMENT NUMBER:

PATENT ASSIGNEE(S):

INVENTOR(S):

DOCUMENT TYPE:

TITLE:

SOURCE:

```
IC
     ICM H01M010-40
CC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
     electrolyte lithium sulfur battery
ST
IT
     Battery electrolytes
        (electrolyte for lithium-sulfur
       battery)
IT
     Secondary batteries
        (lithium; electrolyte for lithium-
        sulfur battery)
ΙT
     60-29-7, Ethyl ether, uses 64-17-5, Ethanol, uses
     67-56-1, Methanol, uses 67-63-0, Isopropanol, uses
     67-68-5, Dmso, uses 68-12-2, Dmf, uses 71-43-2,
     Benzene, uses 75-05-8, Acetonitrile, uses 78-93-3,
     Methylethyl ketone, uses 79-20-9, Methyl acetate
     2-Methyltetrahydrofuran
                              96-48-0, γ-Butyrolactone 96-49-1,
                        105-37-3, Ethyl propionate 105-58-8, Diethyl
     Ethylene carbonate
     carbonate 107-31-3, Methyl formate 108-32-7, Propylene
     carbonate 109-60-4, n-Propyl acetate 109-99-9, Thf, uses
     110-71-4, 1,2-Dimethoxyethane 110-82-7, Cyclohexane, uses
                              111-96-6, Diglyme
     110-86-1, Pyridine, uses
     123-91-1, p-Dioxane, uses 126-33-0, Sulfolane
     141-78-6, Ethyl acetate, uses 420-12-2, Ethylene sulfide
     462-06-6, Fluorobenzene
                              554-12-1, Methyl propionate
     616-38-6, Dimethyl carbonate 623-53-0, Ethylmethyl
     carbonate
                646-06-0, 1,3-Dioxolane 680-31-9,
     Hexamethylphosphoramide, uses 822-38-8, Ethylene
     trithiocarbonate 872-36-6, Vinylene carbonate 930-35-8,
     Vinylene trithiocarbonate 3741-38-6, Ethylene sulfite
     7704-34-9, Sulfur, uses
                             7791-03-9, Lithium perchlorate
     14283-07-9, Lithium tetrafluoroborate 16508-95-5, Bismuth
                21324-40-3, Lithium hexafluorophosphate
     25496-08-6, Fluorotoluene 29935-35-1, Lithium
     hexafluoroarsenate
                          33454-82-9, Lithium triflate
                                                        74432-42-1,
     Lithium polysulfide 90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
       battery)
L61 ANSWER 2 OF 4 HCAPLUS COPYRIGHT 2007 ACS on STN
                        2002:84080 HCAPLUS Full-text
ACCESSION NUMBER:
```

136:137402

sulfur battery

CODEN: EPXXDW

Patent

Electrolyte for a lithium-

Eur. Pat. Appl., 11 pp.

Samsung SDI Co. Ltd., S. Korea

Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok;

Lee, Jeawoan; Jung, Yongju; Kim, Joosoak

LANGUAGE:

English

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PAT	TENT NO.	KIND	DATE	APPLICATION NO.	DATE	
EP	1176658	A2	20020130	EP 2001-117642		
	1176550	- 0	00000000		20010	7
EP	· · · · · · · · · · · · · · · · · · ·	DE, DK	, ES, FR, G	GB, GR, IT, LI, LU, MK, CY, AL, TR	NL, SE, MC,	
KR	2002008703	A	20020131	KR 2000-42735	20000 25	7
KR	2002014196	А	20020225	KR 2000-47348	20000 17	8
JP	2002083633	A	20020322	JP 2001-213414	20010	7
US	2002045101	A1	20020418	US 2001-911083	13 20010 24	7 .
·	6852450 1335652	B2 A	20050208 20020213	CN 2001-132525	20010	7. NO
PRIORITY	Y APPLN. INFO.:			KR 2000-42735	25 A 20000 25	7
				KR 2000-47348	A 20000 17	8

AB An electrolyte for a lithium-sulfur battery includes a first component solvent with a sulfur solubility more than or equal to 20 mM, a second component solvent with a sulfur solubility less than 20 mM, a third component solvent with a high dielec. constant and a high viscosity, and an electrolyte salt. This battery shows excellent capacity and cycle life characteristics.

IT 64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses 71-43-2, Benzene, uses 108-88-3, Toluene, uses 109-60-4, Propyl acetate 110-82-7, Cyclohexane, uses 126-33-0, Sulfolane 462-06-6, Fluorobenzene 623-53-0, Ethylmethyl carbonate RL: DEV (Device component use); USES (Uses) (electrolyte for lithium-sulfur battery)

RN 64-17-5 HCAPLUS

CN Ethanol (CA INDEX NAME)

H3C-СH2-ОН

RN 67-63-0 HCAPLUS CN 2-Propanol (CA INDEX NAME)

RN 71-43-2 HCAPLUS

CN Benzene (CA INDEX NAME)



RN 108-88-3 HCAPLUS

CN Benzene, methyl- (CA INDEX NAME)

RN 109-60-4 HCAPLUS

CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-0-Ac

RN 110-82-7 HCAPLUS

CN Cyclohexane (CA INDEX NAME)



RN 126-33-0 HCAPLUS

CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 462-06-6 HCAPLUS

CN Benzene, fluoro- (CA INDEX NAME)

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F
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RN CN 623-53-0 HCAPLUS

Carbonic acid, ethyl methyl ester (CA INDEX NAME)

```
IC
     ICM H01M010-40
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
CC
ST
     electrolyte lithium sulfur battery
ΙT
     Battery electrolytes
        (electrolyte for lithium-sulfur
       battery)
IT
     Secondary batteries
        (lithium; electrolyte for lithium-
        sulfur battery)
     Synthetic polymeric fibers, uses
IT
     RL: DEV (Device component use); USES (Uses)
        (polysulfides, carbon-polysulfur polymer; electrolyte for
        lithium-sulfur battery)
IT
     Lithium alloy, base
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        battery)
     7440-44-0, Super P, uses
ΙT
     RL: MOA (Modifier or additive use); USES (Uses)
        (activated; electrolyte for lithium-sulfur
       battery)
     64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses
ΙT
     71-43-2, Benzene, uses 79-20-9, Methyl acetate
                                                       96-47-9,
     2-Methyltetrahydrofuran
                              96-48-0, γ-Butyrolactone
                                                         96-49-1,
     Ethylene carbonate 105-37-3, Ethyl propionate 105-58-8, Diethyl
                108-32-7, Propylene carbonate 108-88-3,
     carbonate
                    108-94-1, Cyclohexanone, uses 109-60-4,
     Toluene, uses
                     109-99-9, Thf, uses 110-71-4 110-82-7,
     Propyl acetate
                        111-96-6, Diglyme 126-33-0, Sulfolane
     Cyclohexane, uses
     141-78-6, Ethyl acetate, uses 143-24-8, Tetraglyme
     462-06-6, Fluorobenzene
                              554-12-1, Methyl propionate
     616-38-6, Dimethyl carbonate 623-53-0, Ethylmethyl
     carbonate 646-06-0, 1,3-Dioxolane 1330-20-7, Xylene, uses
     7439-93-2, Lithium, uses 7704-34-9, Sulfur, uses 7704-34-9D,
     Sulfur, organic compound 7791-03-9, Lithium perchlorate
     Lithium tetrafluoroborate
                                 21324-40-3, Lithium hexafluorophosphate
     27359-10-0, Trifluorotoluene
                                  29935-35-1, Lithium
     hexafluoroarsenate
                        33454-82-9, Lithium triflate
                                                         56525-42-9,
     Methylpropyl carbonate, uses 74432-42-1, Lithium polysulfide
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        battery)
     124-38-9, Carbon dioxide, uses
ΙT
                                     7446-09-5, Sulfur dioxide, uses
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9003-20-7, Polyvinyl acetate 10024-97-2, Nitrous oxide, uses RL: MOA (Modifier or additive use); USES (Uses) (electrolyte for lithium-sulfur battery)

L61 ANSWER 3 OF 4 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2000:141485 HCAPLUS Full-text

DOCUMENT NUMBER:

132:168757

TITLE:

Liquid electrolyte lithium-

sulfur batteries

INVENTOR(S):

Chu, May-Ying; De Jonghe, Lutgard C.; Visco,

Steven J.; Katz, Bruce D.

PATENT ASSIGNEE(S):

Polyplus Battery Co., Inc., USA

SOURCE: U.S., 28 pp., Cont.-in-part of U.S. 5,686,201 CODEN: USXXAM

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: 15

PATENT INFORMATION:

PAT	TENT	NO.			KIN	D -	DATE			APP	LICAT	ION I	NO.		D.	ATE
US	6030	- 720			A		2000	0229		US	1997-	9489	69		1	99710
US	5523	179			А		1996	0604		US	1994-	3443	8 4		1	
															1 2	99411 3
US	5582	623			A		1996	1210		US	1995-	4796	87			99506
US	5686	201			А		1997	1111		US	1996-	6866	09		0	
															1 2	99607 6
CA	2305	454			A1		1999	0422		CA	1998-	2305	454		1	99810 6
WO	9919	931			A1		1999	0422		WO	1998-	US21	067			
															1 0	99810 6
	W:	AL,	AM,	ΑŤ,	AU,	AZ,	BA,	BB,	BG,	BR	, BY,	CA,	CH,	CN,	CU,	CZ,
			•								, HR,					
		•	•	•	•	•		•	•		, LT,	•	•	•	•	•
		•	•	•		•					, SD, , YU,		56,	21,	SN,	SБ,
	RW:										, 10, , AT,		CH.	CY.	DE.	DK.
											, NL,					
		•	•	•	•			-	•		, SN,		•	•	,	•
AU	9896	876			Α		1999	0503		AU	1998-	9687	6			
																99810
															0	6
	7418						2001			- D	1000	0.5.0.0	<i>C</i> 7			
ĽР	1021	049			AT		2000	0/20		EP	1998-	9509	6 /		1	99810
															0	
ΕP	1021															
	R:								GB,	GR	, IT,	LI,	LU,	NL,	SE,	MC,
ВĎ	9812		1Ε,				FI,			ВÞ	1998-	1274	a			
DK	901Z	143			v		2000	0049		אני	1990-	1214	,			

							199810 06
JP 2001	520447	Т	20011030	JP	2000-516392		199810
AT 2316	53	Т	20030215	ΑТ	1998-950967		06 199810
US 6358	643	B1	20020319	US	2000-495639		06
						- 0	200002 01
PRIORITY APP	LN. INFO.:			US	1994-344384	A2	199411 23
				US	1995-479687	A2	199506 07
				US	1996-686609	A2	199607 26
		·		US	1997-948969	A	199710 10
				WO	1998-US21067	W	199810 06

OTHER SOURCE(S): MARPAT 132:168757

Disclosed are electrolyte solvents for ambient-temperature lithium-sulfur AB batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula R1(CH2CH2O)nR2, where n ranges between 2 and 10 and R1 and R2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R1 and R2 may together with (CH2CH2O)n form a closed ring. Examples of linear solvents include the glymes (CH3O(CH2 CH2)nCH3). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, N, N-diethylacetamide, N, Ndiethylformamide, dimethylsulfoxide, tetramethylurea, N,N-dimethylacetamide, N,Ndimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions. Examples of acceptor solvents include alcs., glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions.

IT 67-56-1, Methanol, uses 67-68-5,

Dimethylsulfoxide, uses 110-86-1, Pyridine, uses 680-

31-9, Hexamethylphosphoramide, uses

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(liquid electrolyte lithium-sulfur batteries)

67-56-1 HCAPLUS

CN Methanol (CA INDEX NAME)

```
67-68-5 HCAPLUS
RN
     Methane, 1,1'-sulfinylbis- (CA INDEX NAME)
CN
     110-86-1 HCAPLUS
RN
CN
   Pyridine (CA INDEX NAME)
     680-31-9 HCAPLUS
RN
     Phosphoric triamide, N,N,N',N',N'',N''-hexamethyl- (CA INDEX NAME)
CN
     - P— NMe2
IC
     ICM H01M010-40
INCL 429105000
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
     battery lithium sulfur liq electrolyte
ST
ΙT
     Battery electrolytes
     Conducting polymers
        (liquid electrolyte lithium-sulfur
        batteries)
     Carbon black, uses
IT
     Polyoxyalkylenes, uses
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
        (liquid electrolyte lithium-sulfur
        batteries)
ΙT
     Alcohols, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Crown ethers
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
ΙT
     Cryptands
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
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```
(liquid electrolyte lithium-sulfur
       batteries)
IT
     Glycols, uses
    RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
ΙT
     Secondary batteries
        (lithium; liquid electrolyte lithium-
        sulfur batteries)
IT
     Intercalation compounds
     RL: DEV (Device component use); USES (Uses)
        (lithium; liquid electrolyte lithium-sulfur
       batteries)
     7439-93-2, Lithium, uses 7439-93-2D, Lithium, intercalation
IT
     compound, uses 7440-23-5, Sodium, uses 7704-34-9, Sulfur, uses
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     25322-68-3, Polyethylene oxide
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
     (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
IT
     67-56-1, Methanol, uses 67-68-5,
     Dimethylsulfoxide, uses 68-12-2, N,N-Dimethylformamide, uses
     75-52-5, Nitromethane, uses 76-05-1, Trifluoroacetic acid, uses
     107-21-1, Ethylene glycol, uses 110-60-1, Tetramethylenediamine
     110-86-1, Pyridine, uses 110-95-2,
                                  126-73-8, Tributylphosphate, uses
     Tetramethylpropylenediamine
     127-19-5, N,N-Dimethylacetamide 143-24-8, Tetraglyme
     12-Crown-4 512-56-1, Trimethylphosphate 617-84-5,
     N, N-Diethylformamide 632-22-4, Tetramethylurea 680-31-9,
     Hexamethylphosphoramide, uses 685-91-6, N, N-Diethylacetamide
     1493-13-6, Trifluoromethanesulfonic acid
                                                2832-49-7,
     N, N, N', N'-Tetraethylsulfamide 3030-47-5,
     Pentamethyldiethylenetriamine 7446-09-5, Sulfur dioxide, uses
     7637-07-2, Boron trifluoride, uses 14187-32-7, Dibenzo 18-crown-6
     17455-13-9, 18-Crown-6 33100-27-5, 15-Crown-5
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
     7440-44-0, Carbon, uses
IT
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
REFERENCE COUNT:
                         24
                               THERE ARE 24 CITED REFERENCES AVAILABLE
                               FOR THIS RECORD. ALL CITATIONS AVAILABLE
                               IN THE RE FORMAT
L61 ANSWER 4 OF 4 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                         1999:271600 HCAPLUS Full-text
DOCUMENT NUMBER:
                         130:284490
TITLE:
                         Liquid electrolyte lithium-
                         sulfur batteries
                         Chu, May-Ying; De Jonghe, Lutgard C.; Visco,
INVENTOR(S):
                         Steven J.; Katz, Bruce D.
                         Polyplus Battery Company, Inc., USA
PATENT ASSIGNEE(S):
```

SOURCE:

PCT Int. Appl., 57 pp. CODEN: PIXXD2

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: 15

PATENT INFORMATION:

	PAT	TENT I	NO.			KIN		DATE			APPL	ICAT:	ION	NO.			DATE
	WO	9919	- 931			A1		1999	0422		WO 1	998-	US21	067			199810
		₩:	DE, KE, MN,	DK, KG, MW,	EE, KP, MX,	ES, KR, NO,	FI KZ NZ	, GB, , LC,	GE, LK, PT,	GH, LR, RO,	GM, LS, RU,	HR, LT, SD,	HU, LU, SE,	ID, LV,	IL, MD,	IS MC	06 J, CZ, S, JP, G, MK, K, SL,
	110	RW:	GH, ES, CG,	GM, FI, CI,	KE, FR, CM,	LS, GB, GA,	MW GR GN	, SD, , IE, , GW,	SZ, IT, ML,	UG, LU, MR,	ZW, MC, NE,	AT, NL, SN,	BE, PT, TD,	SE, TG			E, DK, J, CF,
	03	0030	720			A		2000	0223		05 1	<i>J J</i> 1	J40J	0 3			199710 10
	CA	2305	454			A1		1999	0422		CA 1	998-	2305	454			199810 06
	AU	9896	876			A		1999	0503		AU 1	998-	9687	6			199810 06
		7418 1021						2001 2000			EP 1	998-	9509	67			199810
	EP	1021 R:	AT,	BE,	CH,	DE,	DK		FR,	GB,	GR,	IT,	LI,	LU,	NL,	SI	06 E, MC,
	BR	9812		IE,	51,			, FI, 2000			BR 1	998-	1274	9			199810 06
	JP	2001	5204	47		Т		2001	1030		JP 2	000-	5163	92			199810 06
	АТ	2316	53			Т		2003	0215		AT 1	998-	9509	67			199810 06
PRIO	RIT	Y APP	LN.	INFO	.:						US 1	997-	9489	69		A	199710 10
											US 1	994-	3443	84		A2	199411 23
											US 1	995-	4796	87		A2	199506 07
						•					US 1	996-	6866	09		A2	199607

WO 1998-US21067

N

199810 06

OTHER SOURCE(S): MARPAT 130:284490

AB Disclosed are electrolyte solvents for ambient-temperature lithium-sulfur batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula R1(CH2CH2O)nR2, where n ranges between 2 and 10 and R1 and R2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R1 and R2 may together with (CH2CH2O)n form a closed ring. Examples of linear solvents include the glymes (CH3O(CH2CH2)nCH3). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, N, N-diethylacetamide, N, Ndiethylformamide, dimethylsulfoxide, tetramethylurea, N, N-dimethylacetamide, N, Ndimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions. Examples of acceptor solvents include alcs., glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions.

IT 67-56-1, Methanol, uses 67-68-5,
Dimethylsulfoxide, uses 110-86-1, Pyridine, uses
680-31-9, Hexamethylphosphoramide, uses

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(liquid electrolyte lithium-sulfur batteries)

RN 67-56-1 HCAPLUS

CN Methanol (CA INDEX NAME)

нзс-он

RN 67-68-5 HCAPLUS CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

о Н3С—S—СН3

RN 110-86-1 HCAPLUS CN Pyridine (CA INDEX NAME)

N

RN 680-31-9 HCAPLUS

CN Phosphoric triamide, N,N,N',N',N'',N''-hexamethyl- (CA INDEX NAME)

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Me2N—P—NMe2
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ICM H01M010-40
IC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
CC
     electrolyte solvent lithium sulfur
ST
    battery
ΙT
     Battery cathodes
     Battery electrolytes
     Secondary batteries
        (liquid electrolyte lithium-sulfur
       batteries)
     Alcohols, uses
IT
     Carbon black, uses
     Carbon fibers, uses
     Glycols, uses
     Polyoxyalkylenes, uses
     Polysulfides
     Sulfides, uses
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Crown ethers
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Cryptands
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
     143-24-8, Tetraethyleneglycol dimethyl ether 7439-93-2, Lithium,
IT
            7439-93-2D, Lithium, intercalation compound, uses 7440-23-5,
     Sodium, uses 7440-44-0, Carbon, uses 7704-34-9, Sulfur, uses
     7791-03-9, Lithium perchlorate 14283-07-9, Lithium
                         21324-40-3, Lithium hexafluorophosphate
     tetrafluoroborate
                       29935-35-1, Lithium hexafluoroarsenate
     25322-68-3, Peo
     33454-82-9, Lithium triflate 74432-42-1, Lithium polysulfide
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
     67-56-1, Methanol, uses 67-68-5,
IT
     Dimethylsulfoxide, uses
                               68-12-2, N, N-Dimethylformamide, uses
     75-52-5, Nitromethane, uses
                                   76-05-1, Trifluoroacetic acid, uses
     107-21-1, Ethylene glycol, uses
                                       110-60-1, Tetramethylenediamine
     110-86-1, Pyridine, uses
                                110-95-2,
     Tetramethylpropylenediamine
                                   126-73-8, Tributylphosphate, uses
     127-19-5, N, N-Dimethylacetamide 512-56-1, Trimethylphosphate
     617-84-5, N, N-Diethylformamide
                                      632-22-4, Tetramethylurea
     680-31-9, Hexamethylphosphoramide, uses 685-91-6,
     N, N-Diethylacetamide 1493-13-6, Trifluoromethanesulfonic acid
     1822-45-3, Tetramethylpropylenediamine
                                              2832-49-7,
     N, N, N', N'-Tetraethylsulfamide
                                     3030-47-5,
                                      7446-09-5, Sulfur dioxide, uses
     Pentamethyldiethylenetriamine.
     7637-07-2, Boron trifluoride, uses
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RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(liquid electrolyte lithium-sulfur

batteries)

IT 294-93-9, 12-Crown-4 14187-32-7, Dibenzo-18-crown-6 17455-13-9,

18-Crown-6 33100-27-5, 15-Crown-5

RL: MOA (Modifier or additive use); USES (Uses)

(liquid electrolyte lithium-sulfur

batteries)

REFERENCE COUNT:

7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN

THE RE FORMAT

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L62 ANSWER 1 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2006:544098 HCAPLUS Full-text

DOCUMENT NUMBER:

145:30918

TITLE:

Electrolyte for lithium-sulfur

batteries

INVENTOR(S):

Kolosnitsyn, Vladimir; Karaseva, Elena

PATENT ASSIGNEE(S):

Oxis Energy Ltd., UK PCT Int. Appl., 24 pp.

SOURCE:

CODEN: PIXXD2

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT:

PRIORITY APPLN. INFO.:

2

PATENT INFORMATION

	NO. 			KIN	D -	DATE		•	APPL:	ICAT:	ION I	NO.		D?	ATE
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	GB,	GD,	GE,	GH,	GM,	HR,	HU,	ID,	IL,	IN,	IS,	JP,	KE,	KG,	KM,
	KN,	KP,	KR,	ΚZ,	LC,	LK,	LR,	LS,	LT,	LU,	LV,	LY,	MA,	MD,	MG,
	MK,	MN,	MW,	MX,	MZ,	NA,	NG,	NI,	NO,	NZ,	OM,	PG,	PH,	PL,	PT,
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	IE,												•	•	·
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RU 2004-135236

Α

200412

GB 2005-4290

Α

200503

02

US 2005-657436P

200503

02

WO 2005-GB4572

200511

29

AB An electrolyte for a lithium-sulfur battery, the electrolyte comprising a solution of at least one electrolyte salt in at least two aprotic solvents. The components of the solution are selected so that the solution is eutectic or close to eutectic. Also disclosed is a lithium-sulfur battery including such an electrolyte. By using a eutectic mixture, the performance of the electrolyte and the battery at low temps. is much improved.

IT 96-48-0, γ-Butyrolactone 96-49-1, Ethylene
 carbonate 108-32-7, Propylene carbonate 109-60-4
 , Propyl acetate 126-33-0, Sulfolane 623-53-0,
 Ethyl methyl carbonate 917-73-7 1003-78-7,
 2,4-Dimethylsulfolane 1977-37-3, Methylpropylsulfone
 7560-59-0, Methylbutylsulfone
 RL: DEV (Device component use); USES (Uses)
 (electrolyte for lithium-sulfur
 batteries)

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

RN 96-49-1 HCAPLUS

CN 1,3-Dioxolan-2-one (CA INDEX NAME)

(°)

RN 108-32-7 HCAPLUS

CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

O Me

RN 109-60-4 HCAPLUS

CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-0-Ac

RN 126-33-0 HCAPLUS

CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

RN 917-73-7 HCAPLUS

CN Methanethial, S,S-dioxide (9CI) (CA INDEX NAME)

RN 1003-78-7 HCAPLUS

CN Thiophene, tetrahydro-2,4-dimethyl-, 1,1-dioxide (CA INDEX NAME)

RN 1977-37-3 HCAPLUS

CN Propane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

RN 7560-59-0 HCAPLUS

CN Butane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

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O
||
|Me__S__Bu-n
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CC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
    electrolyte lithium sulfur battery
ST
IT
     Battery electrolytes
        (electrolyte for lithium-sulfur
       batteries)
IT
     Sulfones
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
       batteries)
IT
     Amines, uses
     RL: MOA (Modifier or additive use); USES (Uses)
        (electrolyte for lithium-sulfur
       batteries)
ΙT
     Secondary batteries
        (lithium; electrolyte for lithium-
        sulfur batteries)
ΙT
     Lithium alloy, base
     RL: TEM (Technical or engineered material use); USES (Uses)
        (electrolyte for lithium-sulfur
       batteries)
IT
     79-20-9, Methyl acetate
                               96-47-9, 2-Methyltetrahydrofuran
     96-48-0, y-Butyrolactone 96-49-1, Ethylene
     carbonate 105-37-3, Ethyl propionate
                                             105-58-8, Diethyl carbonate
     108-32-7, Propylene carbonate 109-60-4, Propyl
             109-99-9, Thf, uses
                                    110-71-4
                                                111-96-6, Diglyme
     126-33-0, Sulfolane 141-78-6, Ethyl acetate, uses
     143-24-8, Tetraglyme 554-12-1, Methyl propionate
                                                          616-38-6,
     Dimethyl carbonate 623-53-0, Ethyl methyl carbonate
     646-06-0, 1,3-Dioxolane 917-73-7 1003-78-7,
     2,4-Dimethylsulfolane 1977-37-3, Methylpropylsulfone
     7439-93-2, Lithium, uses 7560-59-0, Methylbutylsulfone
     7791-03-9, Lithium perchlorate 12136-58-2, Lithium sulfide
     21324-40-3, Lithium hexafluorophosphate 29935-35-1, Lithium
                        56525-42-9, Methyl propyl carbonate, uses
     hexafluoroarsenate
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
       batteries)
     7446-09-5, Sulfur dioxide, uses 7553-56-2, Iodine, uses
IT
     7704-34-9, Sulfur, uses 7726-95-6, Bromine, uses
                                                          7782-50-5,
                      10024-97-2, Nitrous oxide, uses 74432-42-1,
     Chlorine, uses
     Lithium polysulfide
     RL: MOA (Modifier or additive use); USES (Uses)
        (electrolyte for lithium-sulfur
       batteries)
                               THERE ARE 17 CITED REFERENCES AVAILABLE
REFERENCE COUNT:
                         17
                               FOR THIS RECORD. ALL CITATIONS AVAILABLE
                               IN THE RE FORMAT
L62 ANSWER 2 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
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ACCESSION NUMBER: 2006:529227 HCAPLUS Full-text

DOCUMENT NUMBER:

145:11315

TITLE:

Electrolyte for lithium-sulfur

batteries and lithium

sulfur batteries using the

same

INVENTOR(S):

Kolosnitsyn, Vladimir; Karaseva, Elena

The said of the sa

PATENT ASSIGNEE(S): . Oxis Energy Limited, UK; Intellikraft Limited

SOURCE:

Brit. UK Pat. Appl., 23 pp.

CODEN: BAXXDU

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

P.A.	TENT	NO.			KIN:	D -	DATE			APPL	ICAT	ION I	NO.		D	ATE
GE	2420	- 907			А		2006	0607		GB 2	005-	4290				00503
	2420				В		2006					. -			0	2
WC	2006	0590	85		A1		2006	0608		WO 2	005-	GB45	72			00511 9
EF	₩: RW:	CH, GB, KN, MK, RO, TZ, AT, IE, BF, TG, ZW,	CN, GD, KP, MN, RU, UA, BE, IS, BJ, BW, AM,	CO, GE, KR, MW, SC, UG, BG, IT, CF, GH, AZ,	CR, GH, KZ, MX, SD, US, CH, LT, CG, GM, BY,	CU, GM, LC, MZ, SE, UZ, CY, LU, KE, KG,	AU, CZ, HR, LK, NA, SG, VC, CZ, LV, CM, KZ, 2007	DE, HU, LR, NG, SK, VN, DE, MC, GA, MW, MD,	DK, ID, LS, NI, SL, YU, DK, NL, GN, MZ, RU,	DM, IL, NO, SM, ZA, EE, PL, GQ, NA,	DZ, IN, LU, NZ, SY, ZM, ES, PT, GW, SD,	EC, IS, LV, OM, TJ, ZW FI, RO, ML, SL,	EE, JP, LY, PG, TM, FR, SE, MR, SZ,	EG, KE, MA, PH, TN, GB, SI, NE,	BZ, ES, KG, MD, TR, GR, SK,	CA, FI, KM, MG, PT, TT,
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	R:						CZ, LU,									
	2006				A1	•	2006	0608			•					00512 1
PRIORIT	'Y APP	LN.	INFO	.:						RU 2	004-	1352	36	· j		00412
										GB 2	005-	4290	te .			00503 2
										US 2	005-	6574	36P	,		00503 2
										WO 2	005-	GB45	72			00511 9

AB An electrolyte for a lithium-sulfur battery comprises a solution of ≥1 electrolyte salt in ≥2 aprotic solvents. The components of the solution are selected so that the solution is eutectic or close to eutectic. Also disclosed is a lithium-sulfur battery including such an electrolyte. By using a eutectic mixture, the performance of the electrolyte and the battery at low temps. is much improved.

(lithium sulfur battery
electrolytes)

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

RN 96-49-1 HCAPLUS CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 108-32-7 HCAPLUS CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

RN 109-60-4 HCAPLUS CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-0-Ac

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)



RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

RN 1003-78-7 HCAPLUS

CN Thiophene, tetrahydro-2,4-dimethyl-, 1,1-dioxide (CA INDEX NAME)

RN 1977-37-3 HCAPLUS

CN Propane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

RN 7560-59-0 HCAPLUS

CN Butane, 1-(methylsulfonyl)- (9CI) (CA INDEX NAME)

RN 31124-38-6 HCAPLUS

CN Butane, 1-(ethylsulfonyl)- (9CI) (CA INDEX NAME)

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 49

```
Battery electrolytes
IT
     Eutectics
        (lithium sulfur battery
        electrolytes)
    Amines, uses
ΙT
     Carbon black, uses
     Polyoxyalkylenes, uses
     Sulfones
     RL: NUU (Other use, unclassified); TEM (Technical or engineered
    material use); USES (Uses)
        (lithium sulfur battery
        electrolytes)
ΙT
    Lithium alloy, base
     RL: NUU (Other use, unclassified); TEM (Technical or engineered
    material use); USES (Uses)
        (lithium sulfur battery
        electrolytes)
ΙT
     79-20-9, Methylacetate 96-47-9, 2-Methyltetrahydrofuran
     96-48-0, γ-Butyrolactone 96-49-1, Ethylene
     carbonate
                105-37-3, Ethylpropionate
                                            105-58-8, Diethylcarbonate
     108-32-7, Propylene carbonate 109-60-4,
     Propylacetate 109-99-9, THF, uses 110-71-4
                                                     111-96-6, Diglyme
     124-38-9, Carbon dioxide, uses 126-33-0, Sulfolane
     141-78-6, Ethylacetate, uses 143-24-8, Tetraglyme
                                                           554-12-1,
     Methylpropionate 616-38-6, Dimethylcarbonate 623-53-0,
     Ethylmethylcarbonate 646-06-0, 1,3-Dioxolane 1003-78-7,
     2,4-Dimethylsulfolane 1977-37-3, Methylpropylsulfone
     7439-93-2D, Lithium, derivs. 7446-09-5, Sulfur dioxide, uses
     7560-59-0, Methylbutylsulfone 7704-34-9D, Sulfur,
     derivs./polymers 7782-50-5, Chlorine, uses 7791-03-9, Lithium
                  10024-97-2, Dinitrogen oxide, uses
     perchlorate
                                                       18496-25-8,
              20461-54-5, Iodide, uses 21324-40-3, Lithium
     hexafluorophosphate 24959-67-9, Bromide, uses
                                                     25322-68-3,
     Polyethylene oxide 29935-35-1, Lithium hexafluoroarsenate
     31124-38-6, Ethylbutylsulfone 33454-82-9, Lithium
     trifluoromethane sulfonate 39448-96-9 56525-42-9,
     Methylpropylcarbonate, uses 74432-42-1, Lithium sulfide (Li2(Sx))
     90076-65-6, Lithium bis(trifluoromethanesulfonyl)imide
     RL: NUU (Other use, unclassified); TEM (Technical or engineered
     material use); USES (Uses)
        (lithium sulfur battery
        electrolytes)
REFERENCE COUNT:
                         4
                               THERE ARE 4 CITED REFERENCES AVAILABLE FOR
                               THIS RECORD. ALL CITATIONS AVAILABLE IN
                              THE RE FORMAT
L62 ANSWER 3 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
                         2005:1129877 HCAPLUS Full-text
ACCESSION NUMBER:
DOCUMENT NUMBER:
                        143:408181
                         Secondary lithium batteries
TITLE:
                         with good cycle efficiency and durability
                         Imasaka, Koji; Fujioka, Yuichi; Hashimoto,
INVENTOR(S):
                         Tsutomu; Tajima, Hidehiko; Adachi, Kazuyuki;
                         Shibata, Hiroyuki; Kai, Masaaki
                         Mitsubishi Heavy Industries, Ltd., Japan; Kyushu
PATENT ASSIGNEE(S):
                         Electric Power Co., Ltd.
SOURCE:
                         Jpn. Kokai Tokkyo Koho, 12 pp.
                         CODEN: JKXXAF
```

Patent

DOCUMENT TYPE:

ST

lithium sulfur battery electrolyte

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
 JР 2005294028	A	20051020	JP 2004-107291	
0F 2003294020	A	20031020		200403 31
PRIORITY APPLN. INFO.:			JP 2004-107291	-
				200403 31

AB The batteries contain Li-containing mixed oxides as cathode active mass, Li-doped graphite as anode active mass, and nonaq. electrolytes, and show terminal potential of discharge against Li ≤ 0.5 V.

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

RN 68-12-2 HCAPLUS CN Formamide, N,N-dimethyl- (CA INDEX NAME)

CH3 | H3C-N-CH=0

RN 75-05-8 HCAPLUS

CN Acetonitrile (CA INDEX NAME)

H 3 C — C ==== N

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

RN 96-49-1 HCAPLUS CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 107-31-3 HCAPLUS CN Formic acid, methyl ester (CA INDEX NAME)

O==CH-O-CH3

RN 108-32-7 HCAPLUS CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

RN 872-93-5 HCAPLUS
CN Thiophene, tetrahydro-3-methyl-, 1,1-dioxide (CA INDEX NAME)

```
ICM H01M010-40
IC
     ICS H01M004-02; H01M004-58
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
CC
     lithium battery mixed oxide manganese cathode;
ST
     graphite lithium doped anode battery; nonaq
     electrolyte ethylene dimethyl carbonate; ethyl methyl carbonate
     vinylene nonaq electrolyte
ΙT
     Secondary batteries
        (lithium; secondary lithium batteries
        with good cycle efficiency and durability)
IT
     Battery anodes
       Battery cathodes
       Battery electrolytes
        (secondary lithium batteries with good cycle
        efficiency and durability)
     7782-42-5, Graphite, uses
ΙT
     RL: DEV (Device component use); USES (Uses)
        (Li-doped anode; secondary lithium batteries
        with good cycle efficiency and durability)
     12057-17-9, Lithium manganese oxide (LiMn2O4)
IT
     RL: DEV (Device component use); USES (Uses)
        (cathode; secondary lithium batteries with
        good cycle efficiency and durability)
IT
     7439-93-2, Lithium, uses
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
     (Uses)
        (doped in graphite; secondary lithium batteries
        with good cycle efficiency and durability)
     7447-41-8, Lithium chloride, uses 7791-03-9, Lithium perchlorate
IT
     10377-51-2, Lithium iodide 14024-11-4, Lithium
     tetrachloroaluminate 14283-07-9, Lithium tetrafluoroborate
     18424-17-4, Lithium hexafluoroantimonate
                                                21324-40-3, Lithium
     hexafluorophosphate
                           29935-35-1, Lithium hexafluoroarsenate
     33454-82-9, Lithium trifluoromethanesulfonate 131651-65-5, Lithium
     nonafluorobutanesulfonate
     RL: DEV (Device component use); USES (Uses)
        (electrolyte salt; secondary lithium batteries
        with good cycle efficiency and durability)
     67-68-5, Dimethyl sulfoxide, uses 68-12-2,
IT
     N, N-Dimethylformamide, uses 75-05-8, Acetonitrile, uses
                               96-47-9, 2-Methyltetrahydrofuran
     79-20-9, Methyl acetate
     96-48-0, \gamma-Butyrolactone 96-49-1, Ethylene
                 105-58-8, Diethyl carbonate 107-31-3, Methyl
     carbonate
               108-29-2, γ-Valerolactone 108-32-7,
     Propylene carbonate 109-87-5, Dimethoxymethane
     Tetrahydrofuran, uses 110-71-4, 1,2-Dimethoxyethane
     126-33-0, Sulfolane 127-19-5, N,N-Dimethylacetamide
     554-12-1, Methyl propionate 616-38-6, Dimethyl carbonate
     623-53-0, Ethyl methyl carbonate 646-06-0, 1,3-Dioxolane
     872-93-5, 3-Methylsulfolane 1072-47-5,
     4-Methvl-1,3-dioxolane
                             4437-85-8, Butylene carbonate
                                                              19836-78-3
```

RL: DEV (Device component use); USES (Uses)

(electrolyte solvent; secondary

lithium batteries with good cycle efficiency

and durability)

872-36-6, Vinylene carbonate IT

> RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(in nonag. electrolyte; secondary lithium batteries with good cycle efficiency and durability)

L62 ANSWER 4 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2004:402981 HCAPLUS Full-text

DOCUMENT NUMBER:

140:409628

TITLE:

Organic electrolytic solution for

lithium battery

INVENTOR(S):

Kim, Ju-Yup; Ryu, Young-Gyoon; Cho, Myung-Dong

Samsung SDI Co., Ltd., S. Korea

SOURCE:

Eur. Pat. Appl., 19 pp.

CODEN: EPXXDW

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT ASSIGNEE(S):

PA7	rent i	NO.			KINI) - <u>,</u>	DATE			APP 	LICAT	ION	NO.	 D	ATE
EP	1420	- 474			A1		2004	0519		EP	2003-	2540	63		00306
	R:	-		-	-	-	-		•		, IT,			SE,	
KR	2004		45		A		2004	0522		KR	2002-	7104	3	_	00211 5
US	2004	0967	49		A1		2004	0520		US	2003-	6019	07	2	00306
CN	1501	540			A		2004	0602		CN	2003-	1484	67	2	00306
JP	2004	1721:	17		А		2004	0617		JP	2003-	3825	38	2	00311
PRIORITY	Y APP	LN.	INFO	.:						KR	2002-	7104	3	A 2	00211

OTHER SOURCE(S): MARPAT 140:409628

An organic electrolytic solution containing a lithium salt, an organic solvent, and an oxalate compound, and a lithium battery using the organic electrolytic solution are provided. Due to the oxalate compound, the organic electrolytic solution stabilizes lithium metal and improves the conductivity of lithium ions. Also,, the organic electrolytic solution present invention improves charging/discharging efficiency when used in lithium batteries having a lithium metal anode. Especially when the organic electrolytic solution is used in lithium sulfur batteries, the oxalate compound forms a chelate with lithium ions and improves the ionic conductivity and the charging/discharging efficiency of the battery. In addition, due to the chelation of the lithium ions, neg. sulfur ions

remain free without interaction with lithium ions, are highly likely to dissolve in an electrolytic solution As a result, a reversible capacity of sulfur is improved.

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

$$\bigcirc$$

RN 96-49-1 HCAPLUS CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 108-32-7 HCAPLUS CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

IC ICM H01M010-40 ICS H01M006-16

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium battery org electrolyte soln

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IT
    Secondary batteries
        (lithium; organic electrolytic solution for lithium
IT
    Battery electrolytes
        (organic electrolytic solution for lithium battery)
    Lithium alloy, base
IT
    RL: DEV (Device component use); USES (Uses)
        (organic electrolytic solution for lithium battery)
    96-48-0, Y-Butyrolactone 96-49-1, Ethylene
IT
    carbonate 105-58-8, Diethyl carbonate 108-32-7,
    Propylene carbonate 110-71-4 111-96-6, Diethylene glycol
    dimethyl ether 112-36-7, Diethylene glycol diethyl ether
    112-49-2, Triethylene glycol dimethyl ether 126-33-0,
    Sulfolane 463-79-6D, Carbonic acid, ester 616-38-6, Dimethyl
    carbonate 623-53-0, Ethyl methyl carbonate 646-06-0,
    Dioxolane 872-36-6, Vinylene carbonate 1072-47-5, 1,3-Dioxolane,
    4-methyl 1072-57-7, 1,3-Dioxolane, 4,5-dimethyl 4499-99-4,
    Triethylene glycol diethyl ether 7439-93-2, Lithium, uses
    7704-34-9, Sulfur, uses 12137-46-1, Kasolite 29921-38-8,
    1,3-Dioxolane, 4-ethyl 31371-55-8, Ethane, 1,2-dimethoxy-
    homopolymer 73506-93-1, Diethoxyethane 183140-14-9,
    1,3-Dioxetan-2-one 676610-04-1, 1,3-Dioxolane, 4,5-diethyl
    RL: DEV (Device component use); USES (Uses)
        (organic electrolytic solution for lithium
       battery)
IT
    95-92-1, Diethyl oxalate 338-70-5, uses 553-90-2, Dimethyl
    oxalate 615-98-5, Dipropyl oxalate 2050-60-4, Dibutyloxalate
    7704-34-9D, Sulfur, organic compds. 18241-31-1, Bis(4-
    methylbenzyl)oxalate 74432-42-1, Lithium polysulfide
    RL: MOA (Modifier or additive use); USES (Uses)
        (organic electrolytic solution for lithium battery)
L62 ANSWER 5 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                        2004:118572 HCAPLUS Full-text
DOCUMENT NUMBER:
                       140:149163
                        Secondary batteries with nonaqueous electrolytes
TITLE:
                        Saito, Midori; Komaru, Atsuo; Satori, Kotaro;
INVENTOR(S):
                        Inagaki, Naoko; Tanizaki, Hiroaki
                        Sony Corp., Japan
PATENT ASSIGNEE(S):
                        Jpn. Kokai Tokkyo Koho, 32 pp.
SOURCE:
                        CODEN: JKXXAF
DOCUMENT TYPE:
                        Patent
LANGUAGE:
                        Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:
    PATENT NO.
                       KIND
                               DATE APPLICATION NO.
                                                                 DATE
                      A 20040212
                                          JP 2002-199068
    JP 2004047131
                                                                 200207
                                                                 08
```

JP 2002-199068

200207

80

OTHER SOURCE(S): MARPAT 140:149163

PRIORITY APPLN. INFO.:

GI

The battery comprises (A) a cathode, (B) an anode containing metals, alloys, elements, or their compds. that can form compds. with Li, and (C1) a nonaq. electrolyte containing ≥1 solvent(s) selected from a 1st solvent group, i.e. ethylene carbonate, fluoroethylene carbonate, propylene carbonate, butylene carbonate, γ-Bu lactone, and ethylene sulfite and ≥1 solvent(s) selected from a 2nd solvent group, i.e. di-Me carbonate, Me Et carbonate, di-Et carbonate, Me Pr carbonate, di-Pr carbonate, diisopropyl carbonate, DMSO, and di-Et sulfoxide or (C2) a nonaq. electrolyte containing ≥1 oxathiolane-2,2-dioxides I and II (X = H, F, C1, Br, Me, CH2F, CHF2, CF3). The batteries have high energy d. and show excellent charge-discharge cycles.

IT 67-68-5, Dimethyl sulfoxide, uses 70-29-1, Diethyl sulfoxide 96-48-0 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 623-53-0, Methyl ethyl carbonate 1120-71-4 1633-83-6 3741-38-6, Ethylene sulfite 652143-75-4 652143-82-3

RL: DEV (Device component use); USES (Uses)
(nonaq. electrolyte; secondary lithium
batteries with nonaq. electrolytes with cyclic
solvents and noncyclic solvents)

RN 67-68-5 HCAPLUS
CN Methane 1 1'-sulfinylbis- (CA INI

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

RN 70-29-1 HCAPLUS CN Ethane, 1,1'-sulfinylbis- (CA INDEX NAME)

0 || | S = Et

RN 96-48-0 HCAPLUS CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

RN 96-49-1 HCAPLUS CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 108-32-7 HCAPLUS CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

RN 1120-71-4 HCAPLUS CN 1,2-Oxathiolane, 2,2-dioxide (CA INDEX NAME)

RN 1633-83-6 HCAPLUS CN 1,2-Oxathiane, 2,2-dioxide (CA INDEX NAME)

RN 3741-38-6 HCAPLUS
CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

RN 652143-75-4 HCAPLUS
CN 1,2-Oxathiolane, methyl-, 2,2-dioxide (9CI) (CA INDEX NAME)

D1-Me

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RN
     652143-82-3 HCAPLUS
CN
     1,2-Oxathiane, methyl-, 2,2-dioxide (9CI) (CA INDEX NAME)
   D1- Me
    ICM H01M010-40
IC
     ICS H01M004-38
CC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
     Section cross-reference(s): 27
ST
     secondary lithium battery nonaq electrolyte;
     oxathiolanedioxide nonaq electrolyte secondary battery; carbonate
     electrolyte nonaq secondary battery; propionate lithium salt nonaq
     secondary battery
IT
     Secondary batteries
        (lithium; secondary lithium batteries
        with nonaq. electrolytes with cyclic solvents and noncyclic
        solvents)
IT
     Battery electrolytes
        (nonaq.; secondary lithium batteries with
        nonaq. electrolytes with cyclic solvents and noncyclic solvents)
IT
     7440-21-3, Silicon, uses 7440-31-5, Tin, uses
                                                       259750-80-6
     RL: DEV (Device component use); USES (Uses)
        (anode; secondary lithium batteries with
        nonaq. electrolytes with cyclic solvents and noncyclic solvents)
     12190-79-3, Cobalt lithium oxide (CoLiO2)
IT
     RL: DEV (Device component use); USES (Uses)
        (cathode; secondary lithium batteries with
        nonaq. electrolytes with cyclic solvents and noncyclic solvents)
IT
     67-68-5, Dimethyl sulfoxide, uses 70-29-1, Diethyl
     sulfoxide 96-48-0 96-49-1, Ethylene carbonate
     105-37-3, Ethyl propionate 105-58-8, Diethyl carbonate
     108-32-7, Propylene carbonate 554-12-1, Methyl propionate
     616-38-6, Dimethyl carbonate 623-53-0, Methyl ethyl
                 623-96-1, Dipropyl carbonate 1120-71-4
     carbonate
     1633-83-6 3741-38-6, Ethylene sulfite 4437-85-8,
     Butylene carbonate 6482-34-4, Diisopropyl carbonate
                                                             14283-07-9,
     Lithium tetrafluoroborate
                                 21324-40-3, Lithium hexafluorophosphate
     56525-42-9, Methyl propyl carbonate, uses
                                                 114435-02-8,
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652143-72-1

652143-77-6

652143-81-2 **652143-82-3**

652143-73-2

652143-78-7

652143-74-3

Fluoroethylene carbonate

652143-75-4

652143-79-8

652143-76-5

652143-80-1

652143-83-4 652143-84-5 652143-85-6
RL: DEV (Device component use); USES (Uses)
 (nonaq. electrolyte; secondary lithium
 batteries with nonaq. electrolytes with cyclic
 solvents and noncyclic solvents)

L62 ANSWER 6 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:488841 HCAPLUS Full-text

DOCUMENT NUMBER: 139:55432

TITLE: Secondary nonaqueous battery with cathode

containing carbon sulfide polymer

INVENTOR(S): Nakai, Toshihiro; Zhao, Jin-Bao; Uenae,

Keiichiro; Iizuka, Yoshiji; Nagai, Toru

PATENT ASSIGNEE(S): Hitachi Maxell Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003178750	A	20030627	JP 2001-377197	200112
PRIORITY APPLN. INFO.:			JP 2001-377197	200112

OTHER SOURCE(S): MARPAT 139:55432

AB The claimed battery is equipped with a cathode containing a poly(carbon sulfide) active mass layer formed on a current collector and a C-type conductive layer formed on the active mass layer. Preferably, the battery comprises an electrolyte solution containing a S-containing compound solvent and/or an ethylene oxide-type solvent. The battery provides high capacity and long cycle life.

IT 60-29-7, Diethyl ether, uses 67-68-5, Dimethyl

sulfoxide, uses 126-33-0, Sulfolan

RL: DEV (Device component use); USES (Uses)

(electrolyte solvent; secondary

nonaq. battery with cathode containing carbon sulfide

polymer)

RN 60-29-7 HCAPLUS

CN Ethane, 1,1'-oxybis- (CA INDEX NAME)

H3C-CH2-O-CH2-CH3

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

RN 126-33-0 HCAPLUS

Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME) CN



IC ICM H01M004-02

ICS H01M004-58; H01M010-40

52-2 (Electrochemical, Radiational, and Thermal Energy Technology) CC

Secondary batteries IT

(lithium; secondary nonaq. battery with

cathode containing carbon sulfide polymer)

60-29-7, Diethyl ether, uses 67-68-5, Dimethyl ΙT

96-47-9, 2-Methyl-tetrahydrofuran sulfoxide, uses 109-99-9,

Tetrahydrofuran, uses 126-33-0, Sulfolan 143-24-8,

646-06-0, Dioxolane Tetraglyme

RL: DEV (Device component use); USES (Uses)

(electrolyte solvent; secondary

nonaq. battery with cathode containing carbon sulfide polymer)

L62 ANSWER 7 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2003:433057 HCAPLUS Full-text

DOCUMENT NUMBER:

139:9306

TITLE:

Secondary nonaqueous-electrolyte battery

with lithium titanium oxide anode

INVENTOR(S):

Takahashi, Tadayoshi; Kawaguchi, Shinichi;

Koshiba, Tokiharu

PATENT ASSIGNEE(S):

Matsushita Electric Industrial Co., Ltd., Japan

Jpn. Kokai Tokkyo Koho, 5 pp. SOURCE: CODEN: JKXXAF

DOCUMENT TYPE:

Patent

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003163029	. A	20030606	JP 2001-360563	200111 27
PRIORITY APPLN. INFO.:			JP 2001-360563	200111 27

- AΒ The claimed battery is equipped with an anode containing spinel-structure Li Ti oxide Li4/3Ti5/3O4, a cathode showing Li ion-intercalation at ≥3 V (vsLi/Li+), and an electrolyte solution containing propane sultone and/or ethylene sulfite. The anode has high conductivity and the battery provides good high-load discharge cnaracteristics.
- 1120-71-4, Propane sultone 3741-38-6, Ethylene ITsulfite

RL: DEV (Device component use); MOA (Modifier or additive use); USES

(electrolyte additive; secondary nonaq.-electrolyte battery with lithium titanium oxide anode and sulfur compound additive)

RN 1120-71-4 HCAPLUS

CN 1,2-Oxathiolane, 2,2-dioxide (CA INDEX NAME)

RN 3741-38-6 HCAPLUS CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

IT 96-49-1, Ethylene carbonate 623-53-0, Ethyl methyl
 carbonate
RL: DEV (Device component use); USES (Uses)
 (electrolyte solvent; secondary
 nonaq.-electrolyte battery with
 lithium titanium oxide anode and sulfur compound additive)
RN 96-49-1 HCAPLUS
CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

MeO-C-OEt

Battery electrolytes

IC ICM H01M010-40 ICS H01M004-02; H01M004-58 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) lithium titanium oxide anode secondary battery; propane sultone ST ethylene sulfite electrolyte lithium secondary battery IT Secondary batteries (lithium; secondary nonaq.-electrolyte battery with lithium titanium oxide anode and sulfur compound additive) Battery anodes ΙT

(secondary nonaq.-electrolyte battery with

lithium titanium oxide anode and sulfur compound additive)

IT 12031-95-7, Lithium titanium oxide (Li4Ti5012)

RL: DEV (Device component use); USES (Uses)

(anode; secondary nonaq.-electrolyte battery with

lithium titanium oxide anode and sulfur compound additive)

IT 12190-79-3, Cobalt lithium oxide (CoLiO2)

RL: DEV (Device component use); USES (Uses)

(cathode; secondary nonaq.-electrolyte battery with

lithium titanium oxide anode and sulfur compound additive)

IT 1120-71-4, Propane sultone 3741-38-6, Ethylene

sulfite

RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(electrolyte additive; secondary nonaq.-electrolyte

battery with lithium titanium oxide anode and

sulfur compound additive)

IT 96-49-1, Ethylene carbonate 623-53-0, Ethyl methyl

carbonate

RL: DEV (Device component use); USES (Uses)

(electrolyte solvent; secondary nonaq.-electrolyte battery with

lithium titanium oxide anode and sulfur compound additive)

L62 ANSWER 8 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:139093 HCAPLUS <u>Full-text</u>

DOCUMENT NUMBER:

136:203048

TITLE:

Nonaqueous electrolyte solutions containing

phenylsulfonic acids and batteries

INVENTOR(S):

Hinohara, Akio; Ishida, Tatsuyoshi; Hirano,

Chiho

PATENT ASSIGNEE(S):

Mitsui Chemicals Inc., Japan

SOURCE:

Jpn. Kokai Tokkyo Koho, 9 pp. CODEN: JKXXAF

DOCUMENT TYPE:

Patent

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	_		0000 040050	
JP 2002056891	Α	20020222	JP 2000-240850	200008 09
PRIORITY APPLN. INFO.:			JP 2000-240850	
				200008 09

OTHER SOURCE(S):

MARPAT 136:203048

GΙ

The electrolyte solns. contain phenylsulfonic acids I (R1 = H, metal; R2-6 = H, halogen, OH, sulfonic acid group, metal sulfonate, carboxylic acid group, metal carboxylate, C1-10 organic group). Preferably, the organic solvents contain cyclic esters II and/or linear carbonic acid esters III (R7-10 = H, C1-6 alkyl; X = O, CH2). Batteries comprising such electrolytes, e.g. secondary lithium batteries, are also claimed. Batteries with long cycle life are obtained.

IT 96-49-1, Ethylene carbonate 623-53-0, Methylethyl

carbonate 30553-06-1, Sulfobenzoic acid

RL: DEV (Device component use); USES (Uses)
 (organic solvents containing phenylsulfonic acids as
 electrolytes in batteries for long cycle
 lifetime)

RN 96-49-1 HCAPLUS

CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

MeO_U_OEt

RN 30553-06-1 HCAPLUS CN Benzoic acid, sulfo- (CA INDEX NAME)



D1-CO2H

D1-SO3H

electrolytes in batteries for long cycle lifetime)

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

108-32-7 HCAPLUS RN

1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME) CN

ICM H01M010-40 IC

ICS H01M004-02; H01M004-58

52-2 (Electrochemical, Radiational, and Thermal Energy Technology) CC Section cross-reference(s): 25, 27

battery nonag electrolyte phenylsulfonic acid; org solvent ST secondary lithium battery electrolyte; cyclic ester battery nonag electrolyte; carbonate ester battery nonag electrolyte

Secondary batteries IT

> (lithium; organic solvents containing phenylsulfonic acids as electrolytes in batteries for long cycle lifetime)

96-49-1, Ethylene carbonate 623-53-0, Methylethyl ITcarbonate 28877-24-9 30553-06-1, Sulfobenzoic acid 400846-62-0

RL: DEV (Device component use); USES (Uses) (organic solvents containing phenylsulfonic acids as electrolytes in batteries for long cycle lifetime)

96-48-0, γ -Butyrolactone 105-58-8, Diethyl carbonate IT616-38-6, Dimethyl carbonate 108-32-7, Propylene carbonate 872-36-6, Vinylene carbonate 4437-85-8, Butylene carbonate RL: TEM (Technical or engineered material use); USES (Uses) (organic solvents containing phenylsulfonic acids as electrolytes in batteries for long cycle lifetime)

L62 ANSWER 9 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER:

2002:84081 HCAPLUS Full-text

DOCUMENT NUMBER:

136:137403

TITLE:

Electrolyte for a lithium-

sulfur battery

INVENTOR(S):

Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok;

Lee, Jeawoan; Jung, Yongju; Kim, Joosoak

PATENT ASSIGNEE(S):

Samsung SDI Co. Ltd., S. Korea Eur. Pat. Appl., 7 pp.

SOURCE:

CODEN: EPXXDW

PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
 EP 1176659	A2	20020130	EP 2001-117661	200107
EP 1176659 R: AT, BE, CH	A3 , DE, DR	20060531 K, ES, FR, GE	, GR, IT, LI, LU,	25 NL, SE, MC,

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KR 2002008704
                          Α
                                 20020131
                                             KR 2000-42736
                                                                     200007
                                                                     25
    KR 2002008705
                          Α
                                 20020131
                                             KR 2000-42737
                                                                     200007
                                                                     25
    JP 2002075447
                          Α
                                 20020315
                                             JP 2001-213435
                                                                     200107
                                                                     13
    US 2002102466
                          A1
                                 20020801
                                             US 2001-910952
                                                                     200107
                                                                     24
    CN 1335653
                          Α
                                 20020213
                                             CN 2001-132526
                                                                     200107
                                                                     25
PRIORITY APPLN. INFO.:
                                             KR 2000-42736
                                                                     200007
                                                                     25
                                             KR 2000-42737
                                                                  Α
                                                                     200007
                                                                     25
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AB An electrolyte for a lithium-sulfur battery has a solvent having a dielec. constant that is greater than or equal to 20, a solvent having a viscosity that is less than or equal to 1.3, and an electrolyte salt. This battery shows excellent capacity and cycle life characteristics.

IT 60-29-7, Ethyl ether, uses 67-68-5, Dmso, uses 68-12-2, Dmf, uses 71-43-2, Benzene, uses 75-05-8, Acetonitrile, uses 78-93-3, Methylethyl ketone, uses 96-48-0, γ-Butyrolactone 96-49-1, Ethylene carbonate 107-31-3, Methyl formate 108-32-7, Propylene carbonate 109-60-4, n-Propyl acetate 110-82-7, Cyclohexane, uses 110-86-1, Pyridine, uses 123-91-1, p-Dioxane, uses 126-33-0, Sulfolane 420-12-2, Ethylene sulfide **462-06-6**, Fluorobenzene **623-53-0**, Ethylmethyl carbonate 822-38-8, Ethylene trithiocarbonate 930-35-8, Vinylene trithiocarbonate 3741-38-6, Ethylene sulfite 25496-08-6, Fluorotoluene RL: DEV (Device component use); USES (Uses) (electrolyte for lithium-sulfur battery)

RN 60-29-7 HCAPLUS

CN Ethane, 1,1'-oxybis- (CA INDEX NAME)

H3C-CH2-O-CH2-CH3

RN 67-68-5 HCAPLUS CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

о || нзс—5—снз RN 68-12-2 HCAPLUS

CN Formamide, N, N-dimethyl- (CA INDEX NAME)

RN 71-43-2 HCAPLUS

CN Benzene (CA INDEX NAME)



RN 75-05-8 HCAPLUS

CN Acetonitrile (CA INDEX NAME)

$$H3C-C > N$$

RN 78-93-3 HCAPLUS

CN 2-Butanone (CA INDEX NAME)

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

RN 96-49-1 HCAPLUS

CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 107-31-3 HCAPLUS

CN Formic acid, methyl ester (CA INDEX NAME)

O == CH - O - CH 3

RN 108-32-7 HCAPLUS CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

O Me

RN 109-60-4 HCAPLUS CN Acetic acid, propyl ester (CA INDEX NAME)

n - Pr - O - Ac

RN 110-82-7 HCAPLUS CN Cyclohexane (CA INDEX NAME)



RN 110-86-1 HCAPLUS CN Pyridine (CA INDEX NAME)

N

RN 123-91-1 HCAPLUS CN 1,4-Dioxane (CA INDEX NAME)

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)



RN 420-12-2 HCAPLUS CN Thiirane (CA INDEX NAME)

 $\stackrel{\mathtt{S}}{ }$

RN 462-06-6 HCAPLUS CN Benzene, fluoro- (CA INDEX NAME)

F

RN 623-53-0 HCAPLUS CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

RN 822-38-8 HCAPLUS CN 1,3-Dithiolane-2-thione (CA INDEX NAME)

s s

RN 930-35-8 HCAPLUS
CN 1,3-Dithiole-2-thione (CA INDEX NAME)

S S

RN 3741-38-6 HCAPLUS CN 1,3,2-Dioxathiolane, 2-oxide (CA INDEX NAME)

0,s=0

RN 25496-08-6 HCAPLUS



D1-F

D1-Me

INVENTOR(S):

PATENT ASSIGNEE(S):

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IC
     ICM H01M010-40
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
CC
ST
     electrolyte lithium sulfur battery
TI
     Battery electrolytes
        (electrolyte for lithium-sulfur
       battery)
IT
     Secondary batteries
        (lithium; electrolyte for lithium-
        sulfur battery)
ΙT
     60-29-7, Ethyl ether, uses 64-17-5, Ethanol, uses
     67-56-1, Methanol, uses 67-63-0, Isopropanol, uses 67-68-5
     , Dmso, uses 68-12-2, Dmf, uses 71-43-2,
     Benzene, uses 75-05-8, Acetonitrile, uses 78-93-3
     , Methylethyl ketone, uses
                                79-20-9, Methyl acetate
                                                            96-47-9,
     2-Methyltetrahydrofuran 96-48-0, γ-Butyrolactone
     96-49-1, Ethylene carbonate 105-37-3, Ethyl propionate
     105-58-8, Diethyl carbonate 107-31-3, Methyl formate
     108-32-7, Propylene carbonate 109-60-4, n-Propyl
             109-99-9, Thf, uses
                                    110-71-4, 1,2-Dimethoxyethane
     acetate
     110-82-7, Cyclohexane, uses 110-86-1, Pyridine,
           111-96-6, Diglyme 123-91-1, p-Dioxane, uses
     126-33-0, Sulfolane 141-78-6, Ethyl acetate, uses
     420-12-2, Ethylene sulfide 462-06-6, Fluorobenzene
     554-12-1, Methyl propionate 616-38-6, Dimethyl carbonate
     623-53-0, Ethylmethyl carbonate 646-06-0, 1,3-Dioxolane
     680-31-9, Hexamethylphosphoramide, uses 822-38-8, Ethylene
                       872-36-6, Vinylene carbonate 930-35-8,
     trithiocarbonate
     Vinylene trithiocarbonate 3741-38-6, Ethylene sulfite
     7704-34-9, Sulfur, uses 7791-03-9, Lithium perchlorate
     14283-07-9, Lithium tetrafluoroborate 16508-95-5, Bismuth
     carbonate 21324-40-3, Lithium hexafluorophosphate
     25496-08-6, Fluorotoluene 29935-35-1, Lithium
     hexafluoroarsenate
                          33454-82-9, Lithium triflate 74432-42-1,
     Lithium polysulfide 90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        battery)
L62 ANSWER 10 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                         2002:84080 HCAPLUS Full-text
DOCUMENT NUMBER:
                         136:137402
TITLE:
                         Electrolyte for a lithium-
                         sulfur battery
```

Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok;

Lee, Jeawoan; Jung, Yongju; Kim, Joosoak

Samsung SDI Co. Ltd., S. Korea

SOURCE:

Eur. Pat. Appl., 11 pp.

CODEN: EPXXDW

DOCUMENT TYPE:

Patent

LANGUAGE:

FAMILY ACC. NUM. COUNT:

English

PATENT INFORMATION:

	PA:	TENT	NO.			KIN	DATE		AP	PLICA	TION N	o. 		DATE
	EP	1176	- 658			A2	2002	0130	EP	2001	-11764	2		200107
	ΕP	1176												-
		R:							GB, G MK, C			LU, NL,	SI	E, MC,
	KR	2002	0087	03		Α	2002	0131	KR	2000	-42735			200007. 25
	KR	2002	0141	96		A	2002	0225	KR	2000	-47348			
														200008 17
	JP	2002	0836:	33		Α	2002	0322	JP	2001	21341	4		200107 13
	US	2002	0451	01		A1	2002	0418	US	2001	-91108	3		200107
		6852					2005					_		24
	CN	1335	652			A	2002	0213	CN	2001	13252	5		200107 25
PRIOF	RIT	Y APP	LN.	INFO	. :				KR	2000	-42735		A	200007 25
									KR	2000	-47348	·	A	200008 17

AB An electrolyte for a lithium-sulfur battery includes a first component solvent with a sulfur solubility more than or equal to 20 mM, a second component solvent with a sulfur solubility less than 20 mM, a third component solvent with a high dielec. constant and a high viscosity, and an electrolyte salt. This battery shows excellent capacity and cycle life characteristics.

IT 71-43-2, Benzene, uses 96-48-0,

> γ-Butyrolactone 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 108-88-3, Toluene, uses 109-60-4, Propyl acetate 110-82-7, Cyclohexane, uses 126-33-0, Sulfolane 462-06-6, Fluorobenzene 623-53-0, Ethylmethyl carbonate RL: DEV (Device component use); USES (Uses) (electrolyte for lithium-sulfur battery)

71-43-2 HCAPLUS

CN Benzene (CA INDEX NAME)

RN 96-48-0 HCAPLUS

CN 2(3H)-Furanone, dihydro- (CA INDEX NAME)

RN 96-49-1 HCAPLUS

CN 1,3-Dioxolan-2-one (CA INDEX NAME)

RN 108-32-7 HCAPLUS

CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

RN 108-88-3 HCAPLUS

CN Benzene, methyl- (CA INDEX NAME)

RN 109-60-4 HCAPLUS

CN Acetic acid, propyl ester (CA INDEX NAME)

n-Pr-0-Ac

RN 110-82-7 HCAPLUS

CN Cyclohexane (CA INDEX NAME)

```
126-33-0 HCAPLUS
RN
CN
     Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)
     462-06-6 HCAPLUS
RN
CN
     Benzene, fluoro- (CA INDEX NAME)
     623-53-0 HCAPLUS
RN
CN
     Carbonic acid, ethyl methyl ester (CA INDEX NAME)
IC
     ICM H01M010-40
CC
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST
     electrolyte lithium sulfur battery
IT
     Battery electrolytes
        (electrolyte for lithium-sulfur
        battery)
ΙT
     Secondary batteries
        (lithium; electrolyte for lithium-
        sulfur battery)
ΙT
     Synthetic polymeric fibers, uses
     RL: DEV (Device component use); USES (Uses)
        (polysulfides, carbon-polysulfur polymer; electrolyte for
        lithium-sulfur battery)
ΙT
     Lithium alloy, base
     RL: DEV (Device component use); USES (Uses)
        (electrolyte for lithium-sulfur
        battery)
     7440-44-0, Super P, uses
ΙT
     RL: MOA (Modifier or additive use); USES (Uses)
        (activated; electrolyte for lithium-sulfur
        battery)
     64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses 71-43-2
ΙT
     , Benzene, uses
                       79-20-9, Methyl acetate
     2-Methyltetrahydrofuran 96-48-0, \gamma-Butyrolactone
     96-49-1, Ethylene carbonate 105-37-3, Ethyl propionate
     105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate
     108-88-3, Toluene, uses
                               108-94-1, Cyclohexanone, uses
     109-60-4, Propyl acetate 109-99-9, Thf, uses
                                                      110-71-4
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110-82-7, Cyclohexane, uses 111-96-6, Diglyme 126-33-0, Sulfolane 141-78-6, Ethyl acetate, uses 143-24-8, Tetraglyme 462-06-6, Fluorobenzene 554-12-1, Methyl propionate 616-38-6, Dimethyl carbonate 623-53-0, Ethylmethyl carbonate 646-06-0, 1,3-Dioxolane 1330-20-7, Xylene, uses 7439-93-2, Lithium, uses 7704-34-9, Sulfur, uses 7704-34-9D, Sulfur, organic compound 7791-03-9, Lithium perchlorate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 27359-10-0, Trifluorotoluene Lithium hexafluoroarsenate 33454-82-9, Lithium triflate 56525-42-9, Methylpropyl carbonate, uses 74432-42-1, Lithium 90076-65-6 polysulfide RL: DEV (Device component use); USES (Uses) (electrolyte for lithium-sulfur battery) 124-38-9, Carbon dioxide, uses 7446-09-5, Sulfur dioxide, uses 9003-20-7, Polyvinyl acetate 10024-97-2, Nitrous oxide, uses RL: MOA (Modifier or additive use); USES (Uses)

IT(electrolyte for lithium-sulfur battery)

L62 ANSWER 11 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2002:27742 HCAPLUS Full-text

DOCUMENT NUMBER:

136:72342

TITLE:

Nonaqueous-electrolyte solution and secondary

battery using it

INVENTOR(S):

Hinohara, Akio

PATENT ASSIGNEE(S):

Mitsui Chemicals Inc., Japan

SOURCE:

Jpn. Kokai Tokkyo Koho, 10 pp. CODEN: JKXXAF

DOCUMENT TYPE:

Patent

LANGUAGE:

Japanese

FAMILY ACC. NUM. COUNT:

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE	
JP 2002008718	А	20020111	JP 2000-192566		
				200006 27	
PRIORITY APPLN. INFO.:			JP 2000-192566		
				200006 27	

OTHER SOURCE(S): MARPAT 136:72342

The solution consists of a nonaq. solvent containing an anhydride of sulfonic acid and carboxylic acid R1SO3C(0)R2 (R1 and R2 = C1-10 organic group; R1 may be bonded with R2). Optionally, the solution contains HF. A secondary battery containing the above electrolyte solution is also claimed. The battery has good hightemperature storage stability.

IT81-08-3, o-Sulfobenzoic acid anhydride 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 623-53-0, Methyl ethyl carbonate

RL: DEV (Device component use); USES (Uses)

(solvent; nonaq.-electrolyte solution containing sulfonic and carboxylic anhydride for secondary battery)

81-08-3 HCAPLUS RN

CN 3H-2,1-Benzoxathiol-3-one, 1,1-dioxide (CA INDEX NAME)

RN 96-49-1 HCAPLUS

CN 1,3-Dioxolan-2-one (CA INDEX NAME)

C°>-°

RN 108-32-7 HCAPLUS

CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

O Me

RN 623-53-0 HCAPLUS

CN Carbonic acid, ethyl methyl ester (CA INDEX NAME)

MeO_U_OEt

IC ICM H01M010-40

ICS H01M004-02; H01M004-58; H01M006-16

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST sulfonic carboxylic acid anhydride nonaq electrolyte solvent secondary battery

IT Secondary batteries

(lithium; nonaq.-electrolyte solution containing sulfonic and carboxylic anhydride for secondary battery)

IT 81-08-3, o-Sulfobenzoic acid anhydride 96-49-1,

Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7,

Propylene carbonate 616-38-6, Dimethyl carbonate 623-53-0, Methyl ethyl carbonate 872-36-6, Vinylene carbonate 4437-85-8,

Butylene carbonate

RL: DEV (Device component use); USES (Uses)

(solvent; nonaq.-electrolyte solution containing sulfonic and carboxylic anhydride for secondary battery)

L62 ANSWER 12 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN ACCESSION NUMBER: 2000:141485 HCAPLUS Full-text

DOCUMENT NUMBER:

132:168757

TITLE:

Liquid electrolyte lithium-

sulfur batteries

INVENTOR(S):

Chu, May-Ying; De Jonghe, Lutgard C.; Visco,

Steven J.; Katz, Bruce D.

PATENT ASSIGNEE(S):

Polyplus Battery Co., Inc., USA

SOURCE:

U.S., 28 pp., Cont.-in-part of U.S. 5,686,201

CODEN: USXXAM

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: 15

PATENT INFORMATION:

PAT	ENT N	10.			KINI		DATE			APE	PLI	CAT	I NOI	NO.		D.	ATE
		-															
US	60307	720			Α		2000	0229		US	19	97-	9489	69		_	
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US	55231	179					1996	0604		US	19	94-	34438	3 4		1	U
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US	55826	523			Α		1996	1210		US	19	995-	47968	37		1	99506
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																0	6
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																	99810 6
	W:	AL,	AM,	AT,	AU,	AZ,	BA,	BB,	ВG,	BF	٦,	BY,	CA,	CH,	CN,		
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		•		•	•		LC,	•	-		-	-	-	-			
		•		•	•		PL, UG,	•				•	•	36,	51,	SK,	SL,
	RW:	•	•	•	•	•	SD,	•	•		•	•		CH,	CY,	DE,	DK,
		•			-		IE,	•							BF,	ВJ,	CF,
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ΕP	10218																
	R:						ES,		GB,	GF	₹,	IT,	LI,	LU,	NL,	SE,	MC,
BR	98127	•	-	•		•	FI,			BR	19	98-	1274	9			
														-		1	99810
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JP	20015	204	47		T		2001	1030		JP	20	000-	5163	92		1	99810
																	6
ΑT	23165	53			Ţ		2003	0215		ΑT	19	998-	9509	67			
																	99810
US	63586	643			В1		2002	0319		US	21	000-	4956	39		U	6
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01 PRIORITY APPLN. INFO.: US 1994-344384 A2 199411 23 US 1995-479687 Α2 199506 07 US 1996-686609 A2 199607 26 US 1997-948969 Α 199710 10 WO 1998-US21067 199810 06

OTHER SOURCE(S): MARPAT 132:168757

Disclosed are electrolyte solvents for ambient-temperature lithium-sulfur AB batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula R1(CH2CH2O)nR2, where n ranges between 2 and 10 and R1 and R2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R1 and R2 may together with (CH2CH2O)n form a closed ring. Examples of linear solvents include the glymes (CH30(CH2 CH2)nCH3). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, N, N-diethylacetamide, N, Ndiethylformamide, dimethylsulfoxide, tetramethylurea, N,N-dimethylacetamide, N,Ndimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions. Examples of acceptor solvents include alcs., glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions. IT

67-68-5, Dimethylsulfoxide, uses 68-12-2, N,N-Dimethylformamide, uses 110-86-1, Pyridine, uses RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)

(liquid electrolyte lithium-sulfur batteries)

RN 67-68-5 HCAPLUS

CN Methane, 1,1'-sulfinylbis- (CA INDEX NAME)

нас— () Сна

RN 68-12-2 HCAPLUS CN Formamide, N, N-dimethyl- (CA INDEX NAME)

CH3 H3C-N-CH-0

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RN 110-86-1 HCAPLUS
CN Pyridine (CA INDEX NAME)
```



```
IC
    ICM H01M010-40.
INCL 429105000
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
     battery lithium sulfur liq electrolyte
ST
     Battery electrolytes
ΙT
     Conducting polymers
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Carbon black, uses
     Polyoxyalkylenes, uses
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
     (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Alcohols, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Crown ethers
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Cryptands
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Glycols, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
ΙT
     Secondary batteries
        (lithium; liquid electrolyte lithium-
        sulfur batteries)
IT
     Intercalation compounds
     RL: DEV (Device component use); USES (Uses)
        (lithium; liquid electrolyte lithium-sulfur
        batteries)
     7439-93-2, Lithium, uses 7439-93-2D, Lithium, intercalation
IT
     compound, uses 7440-23-5, Sodium, uses 7704-34-9, Sulfur, uses
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
     25322-68-3, Polyethylene oxide
IT
     RL: DEV (Device component use); MOA (Modifier or additive use); USES
```

```
(liquid electrolyte lithium-sulfur
       batteries)
     67-56-1, Methanol, uses 67-68-5, Dimethylsulfoxide, uses
IT
     68-12-2, N, N-Dimethylformamide, uses 75-52-5,
     Nitromethane, uses 76-05-1, Trifluoroacetic acid, uses
                                                               107-21-1,
     Ethylene glycol, uses 110-60-1, Tetramethylenediamine
     110-86-1, Pyridine, uses 110-95-2,
     Tetramethylpropylenediamine 126-73-8, Tributylphosphate, uses
    127-19-5, N, N-Dimethylacetamide 143-24-8, Tetraglyme
                512-56-1, Trimethylphosphate 617-84-5,
     N, N-Diethylformamide 632-22-4, Tetramethylurea
                                                       680 - 31 - 9,
     Hexamethylphosphoramide, uses 685-91-6, N, N-Diethylacetamide
     1493-13-6, Trifluoromethanesulfonic acid 2832-49-7,
    N, N, N', N'-Tetraethylsulfamide 3030-47-5,
     Pentamethyldiethylenetriamine 7446-09-5, Sulfur dioxide, uses
     7637-07-2, Boron trifluoride, uses 14187-32-7, Dibenzo 18-crown-6
     17455-13-9, 18-Crown-6 33100-27-5, 15-Crown-5
     RL: DEV (Device component use); TEM (Technical or engineered
    material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
    7440-44-0, Carbon, uses
IT
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
       batteries)
REFERENCE COUNT:
                        24
                               THERE ARE 24 CITED REFERENCES AVAILABLE
                               FOR THIS RECORD. ALL CITATIONS AVAILABLE
                               IN THE RE FORMAT
L62 ANSWER 13 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                        1999:271600 HCAPLUS Full-text
                        130:284490
DOCUMENT NUMBER:
                        Liquid electrolyte lithium-
TITLE:
                        sulfur batteries
                        Chu, May-Ying; De Jonghe, Lutgard C.; Visco,
INVENTOR(S):
                        Steven J.; Katz, Bruce D.
                        Polyplus Battery Company, Inc., USA
PATENT ASSIGNEE(S):
SOURCE:
                        PCT Int. Appl., 57 pp.
                        CODEN: PIXXD2
                        Patent
DOCUMENT TYPE:
                        English
LANGUAGE:
FAMILY ACC. NUM. COUNT:
                        15
PATENT INFORMATION:
     PATENT NO.
                        KIND
                                DATE
                                           APPLICATION NO.
                                                                   DATE
     _____
     WO 9919931
                               19990422 WO 1998-US21067
                        A1
                                                                   199810
         W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ,
             DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP,
             KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK,
             MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL,
             TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW
         RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK,
             ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF,
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CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

20000229 US 1997-948969

(Uses)

US 6030720

						199710 10
CA	2305454	A1	19990422	CA	1998-2305454	199810 06
AU	9896876	A	19990503	AU	1998-96876	199810 06
AU	741815	В2	20011213			00
EP	1021849	A1	20000726	ΕP	1998-950967	
						199810 06
EP	1021849			CD CI		NI CE MO
	R: AT, BE, CH		LV, FI, RO	GB, GI	R, 1T, L1, LU,	NL, SE, MC,
BR			20000829	BR	1998-12749	
						199810 06
JP	2001520447	T	20011030	JP	2000-516392	199810 06
AT	231653	Т	20030215	АТ	1998-950967	06
						199810 06
PRIORITY	Y APPLN. INFO.:			US	1997-948969	A 199710 10
				US	1994-344384	A2
						199411 23
•				US	1995-479687	A2 199506
						07
				US	1996-686609	A2 199607
						26
				WO	1998-US21067	₩ 199810
						06

OTHER SOURCE(S): MARPAT 130:284490

Disclosed are electrolyte solvents for ambient-temperature lithium-sulfur AB batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula R1(CH2CH2O)nR2, where n ranges between 2 and 10 and R1 and R2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R1 and R2 may together with (CH2CH2O)n form a closed ring. Examples of linear solvents include the glymes (CH3O(CH2CH2)nCH3). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, N, N-diethylacetamide, N, Ndiethylformamide, dimethylsulfoxide, tetramethylurea, N,N-dimethylacetamide, N,Ndimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions. Examples of acceptor solvents include alcs., glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions.

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N, N-Dimethylformamide, uses 110-86-1, Pyridine, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
RN
     67-68-5 HCAPLUS
     Methane, 1,1'-sulfinylbis- (CA INDEX NAME)
CN
 нзс— S— Снз
RN
     68-12-2 HCAPLUS
CN
     Formamide, N, N-dimethyl- (CA INDEX NAME)
     CH3
 нзс- №- сн---о
RN
     110-86-1 HCAPLUS
CN
     Pyridine (CA INDEX NAME)
IC
     ICM H01M010-40
     52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
CC
     electrolyte solvent lithium sulfur
ST
     battery
ΙT
     Battery cathodes
     Battery electrolytes
     Secondary batteries
        (liquid electrolyte lithium-sulfur
        batteries)
ΙT
     Alcohols, uses
     Carbon black, uses
     Carbon fibers, uses
     Glycols, uses
     Polyoxyalkylenes, uses
     Polysulfides
     Sulfides, uses
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
IT
     Crown ethers
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
ΙT
     Cryptands
     RL: MOA (Modifier or additive use); USES (Uses)
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67-68-5, Dimethylsulfoxide, uses 68-12-2,

IT

```
(liquid electrolyte lithium-sulfur
        batteries)
    143-24-8, Tetraethyleneglycol dimethyl ether 7439-93-2, Lithium,
IT
            7439-93-2D, Lithium, intercalation compound, uses
     Sodium, uses 7440-44-0, Carbon, uses 7704-34-9, Sulfur, uses
     7791-03-9, Lithium perchlorate 14283-07-9, Lithium
                         21324-40-3, Lithium hexafluorophosphate
     tetrafluoroborate
     25322-68-3, Peo
                      29935-35-1, Lithium hexafluoroarsenate
     33454-82-9, Lithium triflate 74432-42-1, Lithium polysulfide
     90076-65-6
     RL: DEV (Device component use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
     67-56-1, Methanol, uses 67-68-5, Dimethylsulfoxide, uses
ΙT
     68-12-2, N, N-Dimethylformamide, uses
                                            75-52-5,
     Nitromethane, uses 76-05-1, Trifluoroacetic acid, uses
                                                                107-21-1,
     Ethylene glycol, uses
                             110-60-1, Tetramethylenediamine
     110-86-1, Pyridine, uses
                                110-95-2,
     Tetramethylpropylenediamine
                                   126-73-8, Tributylphosphate, uses
     127-19-5, N, N-Dimethylacetamide 512-56-1, Trimethylphosphate
     617-84-5, N, N-Diethylformamide 632-22-4, Tetramethylurea
     680-31-9, Hexamethylphosphoramide, uses 685-91-6,
     N, N-Diethylacetamide 1493-13-6, Trifluoromethanesulfonic acid
     1822-45-3, Tetramethylpropylenediamine
                                              2832-49-7,
     N, N, N', N'-Tetraethylsulfamide
                                     3030-47-5,
                                      7446-09-5, Sulfur dioxide, uses
     Pentamethyldiethylenetriamine.
     7637-07-2, Boron trifluoride, uses
     RL: DEV (Device component use); TEM (Technical or engineered
     material use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
     294-93-9, 12-Crown-4 14187-32-7, Dibenzo-18-crown-6 17455-13-9,
IT
     18-Crown-6 33100-27-5, 15-Crown-5
     RL: MOA (Modifier or additive use); USES (Uses)
        (liquid electrolyte lithium-sulfur
        batteries)
                         7
                               THERE ARE 7 CITED REFERENCES AVAILABLE FOR
REFERENCE COUNT:
                               THIS RECORD. ALL CITATIONS AVAILABLE IN
                               THE RE FORMAT
L62 ANSWER 14 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:
                         1987:480996 HCAPLUS Full-text
DOCUMENT NUMBER:
                         107:80996
TITLE:
                         Nonaqueous electrochemical cell
INVENTOR(S):
                         Whitney, Thomas A.; Foster, Donald L.
PATENT ASSIGNEE(S):
                         Duracell, Inc., USA
                         U.S., 6 pp.
SOURCE:
                         CODEN: USXXAM
DOCUMENT TYPE:
                         Patent
LANGUAGE:
                         English
FAMILY ACC. NUM. COUNT:
PATENT INFORMATION:
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PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 4670363	A	19870602	US 1986-910694	
				198609
				22
WO 8802188	A1	19880324	WO 1987-US2191	

198708 31 W: AU, BR, DK, JP, KR RW: AT, BE, CH, DE, FR, GB, IT, LU, NL, SE 19880407 AU 1987-80375 AU 8780375 Α 198708 31 EP 282576 Α1 19880921 EP 1987-906615 198708 31 R: AT, BE, CH, DE, FR, GB, IT, LI, LU, NL, SE 19890406 JP 01501026 JP 1987-506017 198708 31 CA 1282825 С 19910409 CA 1987-547554 198709 22 19880707 DK 1988-2823 DK 8802823 Α 198805 24 PRIORITY APPLN. INFO.: US 1986-910694 Α 198609 22 WO 1987-US2191 Α 198708 31

AB An improved electrolyte for an alkali or alkaline earth metal battery comprises an alkali-metal or alkaline earth salt complexed with a monomeric or polymeric polyfunctional chelating tertiary amine containing ≥2 N atoms, a 1st solvent selected from aprotic aromatic organic solvents and their mixts., and a 2nd solvent selected from aprotic organic solvents having a dielec. constant € ≥20 and their mixts. The 2nd

solvent is present in an amount sufficient to increase the conductivity measured at 25° and 1 kHz to $\geq 10-3/\Omega$ -cm. The 1st solvent is selected from the group of C6H6, MePh, xylenes, pyridine, and N-methylpyrrole. The 2nd solvent is selected from the group of sulfolane, 3-methylsulfolane, and 3-methyl-2-oxazolidinone (I). The tertiary amine is selected from the group of pentamethyldiethylenetriamine (PMDT), tetramethylethylenediamine, tetramethylcyclohexanediamine,

hexamethyltriethylenetetramine, and tris-(β - dimethylaminoethyl)amine, and their mixture. The resp. conductivities at 25° of 0.8 M LiI.PMDT in MePh, I, and 1:1 (volume) MePh-I were 1.3 + 10-5, 6.2 + 10-3, and 7.2 + 10-3/ Ω -cm. High cycle lives of Li batteries having the invention electrolyte are also reported.

IT 108-32-7, Propylene carbonate 108-88-3, Toluene,
 uses and miscellaneous 110-86-1, Pyridine, uses and
 miscellaneous 126-33-0, Sulfolane.

RL: USES (Uses)

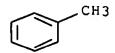
(electrolytes with solvent mixts. containing, conductivity of, for batteries)

RN 108-32-7 HCAPLUS

CN 1,3-Dioxolan-2-one, 4-methyl- (CA INDEX NAME)

O Me

RN 108-88-3 HCAPLUS CN Benzene, methyl- (CA INDEX NAME)



RN 110-86-1 HCAPLUS
CN Pyridine (CA INDEX NAME)

N

RN 126-33-0 HCAPLUS CN Thiophene, tetrahydro-, 1,1-dioxide (CA INDEX NAME)

IC ICM H01M006-14

INCL 429196000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 76

ST lithium battery nonaq electrolyte; iodide
lithium pentamethyldiethylenetriamine battery
electrolyte; toluene methyloxazolidinone battery electrolyte; elec
cond battery electrolyte

IT Batteries, secondary

(lithium, with electrolyte containing lithium salt complexed with tertiary amines in organic solvent mixture)

96-54-8, N-Methylpyrrole 108-32-7, Propylene carbonate 108-88-3, Toluene, uses and miscellaneous 110-86-1, Pyridine, uses and miscellaneous 126-33-0, Sulfolane 646-06-0, Dioxolane 19836-78-3, 3-Methyl-2-oxazolidinone RL: USES (Uses)

(electrolytes with solvent mixts. containing, conductivity of, for batteries)